

**Draft** work programme 2018-2020  
of the Horizon 2020 Societal Challenge  
**"Clean Secure and efficient energy" (SC3)**

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*This is a working document, subject to continuous changes.*

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DRAFT

## INTRODUCTION

Accelerating the transition to a low-carbon economy is a central challenge of our time and a key political priority of the EU. Taking forward the renewed momentum from the COP21 Paris Agreement, the Commission has underpinned its ambitious energy and climate policy, embodied in the Energy Union, with the "Clean Energy for all Europeans" package, adopted in November 2016. This comprehensive set of legislative proposals pursues the three overarching goals: (i) energy efficiency first, (ii) Europe as a leader in renewables, and (iii) a fair deal to consumers. Research and Innovation plays an important role in accelerating the transition to a low-carbon economy by enlarging the portfolio of available options and bringing down costs. At the same time, it is an important element for boosting the EU's competitiveness in clean energy technologies, opening up an enormous potential for growth and jobs.

This work programme supports research, demonstration, innovation and market-uptake actions across different low-carbon energy sectors, notably in the core priorities identified in the Energy Union Strategy<sup>1</sup>: renewable energy; smart energy systems; energy efficiency; and, as an additional priority, Carbon Capture Utilization and Storage (CCUS). The Energy Union priorities are jointly implemented by the stakeholder community, national authorities and the Commission through the ten key actions of the EU Strategic Energy Technology Plan (SET Plan)<sup>2</sup>. A special focus in this work programme, and in other work programmes across Horizon 2020, is put on the strategic priorities highlighted in the Communication "Accelerating Clean Energy Innovation"<sup>3</sup> – decarbonising the EU building stock; strengthening EU leadership on renewables; and developing affordable and integrated energy storage solutions. In addition, this work programme also includes activities that underpin other commitments of the "Accelerating Clean Energy Innovation" Communication<sup>4</sup>.

At the international level, the Commission pushes the acceleration of energy innovation through the Mission Innovation Initiative<sup>5</sup> which was launched at COP21 and currently comprises 23 members which together account for the largest part of the global CO<sub>2</sub> emissions and clean energy R&I efforts. This work programme includes a number of specific actions<sup>6</sup> which directly target an increased international cooperation of EU Member States and Associated Countries in the context of Mission Innovation. This also includes, in line with the spirit of the Paris Agreement which emphasises the need for global cooperation on technology development and transfer, cooperation with African countries on renewable energies<sup>7</sup>.

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<sup>1</sup> COM (2015) 80

<sup>2</sup> COM SET Plan 2015

<sup>3</sup> COM (2016) 763

<sup>4</sup> e.g. the better link to the Smart Specialisation Platforms; increased funding for the InnovFin EDP facility; Horizon Flagship Prizes; support for Mission Innovation; and strengthened cooperation with African countries.

<sup>5</sup> <http://mission-innovation.net/about/>

<sup>6</sup> E.g. topics LC-SC3-RES-3-2020, LC-SC3-RES-17-2020, LC-SC3-RES-23-2019, LC-SC3-NZE-4-2019-2020, LC-SC3-CC-1-2018-2019-2020

<sup>7</sup> Topics LC-SC3-JA-3-2018 and LC-SC3-JA-4-2019

This work programme fully embraces the "3 O strategy" which calls for open innovation, open science and being open to the world (see also above). Activities target a more bottom-up, user-centred energy system which is a driver for more innovation and made possible thanks to other innovations, notably the digitisation of core aspects of the energy market. A greater emphasis on open innovation and open science should lead to more opportunities, especially for smaller companies, to bring research results to the marketplace.

This work programme addresses research, innovation and market uptake activities in and across specific energy sectors as well as activities to maximise synergies between EU and national public support for clean energy R&I, aiming also at increasing leverage of private funding. It contributes in its entirety to the spending targets on climate action and sustainable development, addressing in particular the Sustainable Development Goals (SDGs) 7 ("Ensure access to affordable, reliable, sustainable and modern energy for all") and 13 ("Take urgent action to combat climate change and its impacts").

Efforts to secure Europe's technological leadership must be complemented by substantial production capabilities and technology supply chains across Europe. Industrial participation in the programme is therefore crucial.

The transformation of the energy system encompasses technological, societal, cultural, economic and environmental aspects. In line with the policy priorities, this work programme puts a particular emphasis on enabling consumers to actively participate in the energy transition which is facilitated through the progressing digitisation. In this context, the integration of different social sciences and humanities fields, as well as a responsible research and innovation approach<sup>8</sup>, is of high importance.

The huge majority of activities included in this work programme contribute to the focus area "Building a low-carbon, climate resilient future" which pools relevant activities across different work programmes with the objective to stimulate the development of solutions capable of achieving carbon neutrality and climate resilience by 2050. In addition, this work programme also includes activities which contribute to the focus areas "Connecting economic and environmental gains – the Circular Economy" and the focus area "Digitising and transforming European industry and services".

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 respectively<sup>9</sup>.

The priorities taken up in this work programme are based on a broad stakeholder consultation, notably in the context of the SET-Plan 10 key actions<sup>10</sup> and the Communication "Accelerating

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<sup>8</sup> [http://ec.europa.eu/research/swafs/pdf/rome\\_declaration\\_RRI\\_final\\_21\\_November.pdf](http://ec.europa.eu/research/swafs/pdf/rome_declaration_RRI_final_21_November.pdf)

<sup>9</sup> 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 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.

<sup>10</sup> <https://setis.ec.europa.eu/>

Clean Energy Innovation", but also through a targeted consultation on policy supporting actions and market uptake, or inputs from stakeholder associations (e.g. Strategic Research Agendas of Technology and Innovation Platforms).

Grant beneficiaries under this work programme part will engage in research data sharing by default, as stipulated under Article 29.3 of the Horizon 2020 Model Grant Agreement (including the creation of a Data Management Plan). Participants may however opt out of these arrangements, both before and after the signature of the grant agreement. More information can be found under General Annex L of the work programme.

Activities specifically targeting Fuel Cells and Hydrogen are not supported under this work programme, but through calls for proposals of the Fuel Cells and Hydrogen JU<sup>11</sup>.

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<sup>11</sup> <http://www.fch.europa.eu/>

**CALL FOR PROPOSALS: "BUILDING A LOW-CARBON, CLIMATE RESILIENT FUTURE: SECURE, CLEAN AND EFFICIENT ENERGY"**

This call includes the contribution of the Horizon 2020 Societal Challenge "Secure, clean and efficient energy" to the focus area "Building a low-carbon, climate resilient future" which underpins the goals of the COP21 Paris Agreement and the "Clean Energy for all European" package, including the Communication "Accelerating Clean Energy Innovation" (COM (2016) 736), with concrete R&I actions focussing on the accelerated transformation of the energy system, and other sectors, towards carbon neutrality.

Achieving carbon neutrality in the energy sector – while ensuring at the same time a more efficient energy use, a secure supply of energy, affordable prices and low environmental impact – is a complex endeavour which requires R&I activities on multiple fronts. Activities supported in this call should deliver:

- on the supply side, cheaper and more performant generation technologies which are better integrated in various levels of the energy system;
- a smarter, more flexible and resilient energy system;
- on the demand side, increased overall energy efficiency and provision of means to enable consumers to play a more active role in the energy transition;
- a better understanding of the specific socio-economic contexts in which the energy transition takes place which will allow to address obstacles in a more effective way;
- increased market-uptake of innovations, including the implementation of energy policy, the preparation for rolling-out investments, and the support for capacity-building.

**1. Energy efficiency**

**1. Upgrading buildings' energy performance and smartness**

***LC-SC3-EE-1-2018-2019-2020: Decarbonisation of the EU building stock: innovative approaches and affordable solutions changing the market for buildings renovation***

Specific challenge: The market for deep renovation of buildings needs to be transformed in terms of technologies, processes and business models. The multiple benefits of improved energy efficiency are well known, but more action is needed for Europe to achieve the higher rates of renovation that would decarbonize the building stock and meet long-term climate and energy targets. In particular, deep renovations need to become more attractive to all relevant stakeholders, more reliable in terms of performance, less disruptive for occupants, less time-consuming, and more cost-effective. There is a need to demonstrate and roll out holistic consumer-centred solutions that involve the whole value chain, ensuring high levels of comfort and a high quality of the indoor environment.

Scope (2018, 2019): Proposals should demonstrate solutions that ensure faster and more cost-effective deep renovations that result in energy performance equivalent to Nearly Zero Energy Buildings. Proposals should include innovations in technology and in design and construction methods and on-site works organisation, industrialization and lowering cost of energy retrofitting, business models and the holistic integration of disciplines across the value chain. Proposals should also consider energy efficient and low carbon solutions to retrofit building-level heating and cooling systems and the integration of on-site renewable energy generation<sup>12</sup>. They could also consider further development and improvement of hybrid energy systems using fossil fuel based heating systems coupled with electricity-based heating systems.

Solutions should include quick and simple installation of components and systems, minimizing disruption for building occupants and the time spent on site. Proposals should include monitoring and displaying of real time energy performance and other relevant data and consider the ways in which consumers and others could access and make use of such information. Solutions should ensure high levels of occupant comfort and indoor environmental quality (e.g. air quality, humidity) and should address the multiple benefits of energy efficiency. Proposals should demonstrate solutions that aim for large scale roll-out according to defined business models.

Projects are expected to bring the technology to TRL level 8-9 (please see part G of the General Annexes).

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

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.

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

- Primary energy savings triggered by the project (in GWh/year per million Euro of EU funding);
- Investments in sustainable energy triggered by the project (million Euro of investments per million Euro of EU funding);
- Energy performance in the renovated buildings that equate to nearly Zero Energy Buildings;
- Measurable cost reduction compared with a typical renovation (i.e. a renovation that meets current minimum requirements of existing building regulations) or major energy performance improvement at comparable cost;
- Reduction of time needed on site for renovation works by 20% compared to current national standard practice;

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<sup>12</sup> possible synergies with RES-3-2018: Renewable energy system integrated at a building or an industrial site, RES-4-2018: Increased performance of technologies for shallow geothermal heating and cooling solutions and their integration in the energy system, RES-5-2018: Demonstrate significant cost reduction for built-in PV solutions for "(nearly) Zero Energy Buildings"

- Demonstration of the effectiveness and replicability of the proposed solutions to lead to an increased rate of renovation for defined building typologies in several districts/cities/regions.

Type of action: IA

Scope (2020): Projects are expected to increase scale, ambition and market uptake and up-scaling of deep energy renovation solutions that excel in terms of technologies, renovation and/or decision-making processes, service provision and/or business models.

Proposals are expected, as a minimum, to include the following activities:

- demonstrate deep/NZEB renovations approaches more reliable, faster, cheaper and easier to implement than standard practices;
- demonstrate a high replication, sustainability and market change potential of the proposed solutions including viable concepts for financing the renovation;
- Overcome all relevant barriers simultaneously (e.g. consumer acceptance, uptake by the professionals, financing, legal/regulatory, decision-making etc.);
- Demonstrate effective involvement of and communication and dissemination to the buildings supply chain.

In addition, proposals should, wherever possible:

- include convincing business models;
- offer guarantees of energy performance;
- employ innovative working practices, processes and offers;
- propose attractive package solutions which offer multiple benefits;
- include monitoring of the real energy performance in-use before and after the renovation.

Furthermore, proposals may also, where relevant:

- offer guarantees of energy performance and of consumer service;
- establish new or amend existing standards, certificates, protocols or other quality assurance mechanisms including for skilled workers;
- address split incentives and/or counter-productive structures, regulations and incentives;
- pursue step-by-step renovation approaches;
- include building logbooks/passports and/or individual building renovation roadmaps and related concepts, as well as lean production approaches.

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

- Primary Energy savings triggered by the project (in GWh/year per million Euro of EU funding);

- Investments in sustainable energy triggered by the project (million Euro of investments per million Euro of EU funding);
- Replication of the chosen renovation approach in specific district/cities/regions/countries to reach an increased rate of deep/nZEB renovation at large scale;
- Number of public or private renovation schemes set up;
- Number of dwellings or square meters triggered to be renovated.

Type of action: CSA

### ***LC-SC3-EE-2-2018-2019: Integrated home renovation services***

Specific Challenge: Many project promoters – public authorities, individuals or businesses – lack the skills and capacity to set up, implement and finance ambitious clean energy building projects. In addition, many project developers still face obstacles in raising the necessary up-front costs for their projects – particularly as the small-size of investments and the lack of turnkey solutions increase implementation cost – and lack access to attractive and adequate financing products from the market.

Scope: This priority aims at creating new dedicated local or regional "integrated services" for homeowners and supporting the replication of existing ones. The developed services should cover the whole "customer journey" from technical and social diagnosis, technical offer, contracting of works, structuring and provision of finance (e.g. loans), to the monitoring of works and quality assurance. Such integrated services should be operational at the end of the project and create more demand for holistic approaches as a result of improved offer by trustful market operators and better awareness from homeowners. They should also support the streamlining of standards and practices into consistent and transparent processes investors can rely on, and by doing so help connect the supply of finance with demand for it.

Proposals should build upon the promising experiences of integrated renovation services emerging in Europe and aim at developing / improving economically viable business models, ultimately running without the need for public subsidies.

In practice, projects funded under this topic will optimise the services required along the renovation process (based on a thorough analysis of the local needs and actors in place), improve trust and awareness of homeowners towards such services, reduce renovation costs through standardised approaches (e.g. optimized business processes, standardised contractual arrangements, standardized technical solutions, branding of the proposed services, ...), help improve their legal and regulatory environment, and overall improve financing conditions for energy renovation.

The services can be developed through dedicated operators (new public or public/private entity or mandated private operator) and/or through an improved co-ordination between existing local actors.

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

- Implementation and upscale of economically viable business models, ultimately running without the need for public subsidies. Data evidence made available to market actors. Proof of the replication of these initiatives by other market actors;
- Availability of adequate financing offer for integrated renovation services;
- Strong and trustworthy partnerships with local actors (e.g. SMEs, financial institutions, energy agencies) and quality of the proposed services recognized by market actors;
- Development of large, locally-developed investment pipelines for home renovation, connecting the supply of finance with demand for it (in million Euro of investments within the first 5 years);
- Uptake of home energy renovation at local level and corresponding primary energy savings triggered (in GWh/year per million Euro of EU funding).

Type of action: CSA

***LC-SC3-EE-3-2019-2020: Stimulating demand for sustainable energy skills in the construction sector***

Specific Challenge: Based on results of the BUILD UP Skills initiative, in particular the National Qualification Platforms and Roadmaps, as well as the qualification and training schemes developed in various Member States, the challenge is now to act at market level and to support legislative changes that will stimulate the demand for energy skills.

The objective is to increase the number of skilled building professionals and/or blue collar workers across the building, operation and maintenance value chain (designers, architects, engineers, building managers, technicians, installers, blue collar workers including apprentices, and other building professionals), with a specific focus on the engagement of SMEs. Recourse to skilled professionals/workers both for renovations and new constructions should be made more attractive and easier for companies and home owners alike.

Scope: The focus of submitted proposals should be on the direct stimulation of demand for energy skills in construction. This is calling for the development, up-scaling and combination of a range of tools and initiatives, e.g.:

- Tools facilitating the mutual recognition of energy skills and qualifications in the construction sector: development of sustainable energy skills passports/registers for workers at regional/national level and support for their take up at EU level, mobile applications facilitating the comparison of workers' skills and qualifications between countries (e.g. by enabling the direct comparison of learning outcomes);
- National, regional or local initiatives raising awareness of home owners and tenants about the benefits of sustainable energy skills and providing financial incentives for renovations done using skilled workers/professionals;
- Support to public authorities for the development of new legislative frameworks, e.g. requirements for skilled workers in public procurement;
- Partnerships with producers and retailers of construction products (e.g. DIY stores) to raise awareness of the salesforce and of consumers about energy efficient products and good practice in construction/renovation;

- Initiatives reinforcing the link between skills/education and energy performance/quality of construction e.g. tools showing the reduction of the performance gap as result of an increase quality of the works.

Proposals need to be focused and are not necessarily required to address the whole range of professions and crafts involved in the building sector. They may however consider the entire design chain (e.g. manufacturers), material life cycles and embodied energy. Adequate consideration should also be given to improved appreciation of the end user's needs including the quality of indoor environment (thermal and visual comfort, acoustics, air quality, etc.) as well as improved operation and maintenance.

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 Impacts: Proposals are expected to demonstrate the impacts listed below, where applicable, using quantified indicators and targets wherever possible:

- Primary Energy savings triggered by the project (in GWh/year per million Euro of EU funding) Measurable energy savings and/or renewables production resulting from improved skills;
- Investments in sustainable energy triggered by the project (million Euro of investments per million Euro of EU funding);
- Increased number of certification schemes for energy efficiency skills;
- Improved mutual recognition of sustainable energy skills between Member States and neighbouring countries;
- Improved collaboration and understanding across different trades and professional groups;
- Increased market acceptance of sustainable energy skills;
- Legislative changes stimulating the demand for energy skilled construction workers/professionals;
- Demonstrated reduction in the gap between designed and actual energy performance through improved quality of construction.

Type of action: CSA

#### ***LC-SC3-EE-4-2019-2020: Upgrading smartness of existing buildings through innovations for legacy equipment***

Specific challenge: An essential part of Europe's clean energy transition is the changing role of buildings from energy consumers to active contributors to the energy system, ensuring distributed energy generation from renewable energy sources, energy storage, load reduction through energy efficiency and load shifting through demand response. Innovative technologies will enable smart buildings to interact with their occupants and the grid in real time and to manage themselves efficiently, so as to become an active element of the energy system. Intelligent and connected devices, sensors and controllers, supported by the development of new business models for new energy services, will create new opportunities for energy consumers.

Today in the EU, the existing building stock represents the main challenge for a more efficient energy use, in buildings as well as across the whole energy system. The smart readiness of buildings may evolve faster for devices and systems easily replaced and installed, than for other parts of the building's equipment such as HVAC and DHW systems etc. due to higher costs of replacement, longer lifecycles and difficulties related to the integration in buildings. This installed equipment remains highly relevant for buildings interactions with the energy system, making its upgrade to higher levels of smartness an essential step.

Scope: Proposals should demonstrate technological solutions to manage energy within existing buildings and interact with the grid providing energy efficiency, flexibility, generation and storage, based on user preferences and requests. These solutions should be aimed to upgrade existing buildings, either residential or tertiary, using automation and IT to offer new services and control to the building users, thereby improving their comfort and increasing their satisfaction.

Proposals should demonstrate how the smart systems, smart controls and smart appliances can be integrated seamlessly in existing buildings to interface and/or to control the major energy consuming domestic appliances that are already installed. These pilots should involve several types of domestic appliances with longer lifecycles (boilers, radiators, DHW preparation etc.) and with shorter lifecycles (dryers, washing machines, fridges, etc.), testing several types of control modes (ON/OFF, power modulation, etc.) possible for a given type of appliance. Recharging points for electric vehicles and other forms of energy storage should also be incorporated in the pilots. The proposed solutions should not adversely affect the original functionalities, product quality, lifetime, as well as warranties of the appliances.

Besides the pilot demonstrations, proposals should outline business models and strategies for the broad uptake of the proposed smart systems into specific building typologies in Europe and their integration with evolving electricity markets, e.g. dynamic pricing or other services and information offered by energy suppliers and/or aggregators. Integrations with other energy networks (e.g. DHC) can also be considered.

The solutions should focus on user-friendliness: easy installation and maintenance, maximising consumer comfort (e.g. self-learning) and information on own consumption (e.g. recommendations to the user in order to maximise savings) as well as on gains from its contribution to grid operation.

A realistic estimate should be provided on the total energy savings/year and total power that will be available for demand response actions from the appliances retrofitted with the innovations demonstrated in the proposal.

The projects should involve technology providers (manufacturers of appliances, smart control/home systems providers), energy services providers (aggregators and/or suppliers and/or ESCO's), electricity system operators and other actors as relevant.

The activities are expected to be implemented at TRL 6-9 (please see part G of the General Annexes).

The Commission considers the proposals requesting a contribution from the EU of between 3 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.

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

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

- Primary Energy savings triggered by the project (in GWh/year per million Euro of EU funding);
- Investments in sustainable energy triggered by the project (million Euro of investments per million Euro of EU funding);
- Upgrade of existing buildings to higher smartness levels, including a significantly enlarged base of existing building equipment and appliances monitored by energy management systems and activated through demand response actions;
- Reduction in energy consumption and costs, exceeding the additional consumption from IT and its cost.

Type of Action: IA

### ***LC-SC3-EE-5-2018-2019-2020: Next-generation of Energy Performance Assessment and Certification***

Specific Challenge: Under the Energy Performance of Buildings Directive<sup>13</sup>, all EU countries have established independent certification systems. However, current practices and tools of energy performance assessment and certification applied across Europe face a number of challenges.

Assessment processes and certificates have to become more reliable, user-friendly, cost-effective, comparable and compliant in order to instil trust in the market and incite investments in energy efficiency. They have to reflect increasingly the smart dimension of buildings and at the same time, facilitate the convergence of Energy Performance Certificates (EPCs) across the EU.

Next-generation energy performance certification schemes will assess buildings in a holistic manner across several complimentary dimensions: envelope performances, system performances and smart readiness (i.e. the ability of buildings to be smartly monitored and controlled and, to get involved in demand-side management strategies).

Scope (2018): Proposals should aim at developing new methods and technologies, starting from TRL 3-4 (please see part G of the General Annexes), and targeting TRL 6-7 (please see part G of the General Annexes) by the end of the project, for the preparation of EPCs making use and combining data coming from various sources (Building Information Modelling, Internet of Things, smart meters, sensors, weather patterns, etc.). The proposed solution should facilitate a gradual shift to greater use of IT for future EPCs. It should develop standardised processes enabling a more cost effective, accurate and dynamic measurement and verification of energy savings and of variable consumption patterns.

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.

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

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<sup>13</sup> Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings

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

- Evolution of energy performance assessment practice across the EU;
- Increased accuracy and cost-effectiveness of EPCs.

Type of action: RIA

Scope (2019): Proposals should address the definition and demonstration of innovative approaches for the assessment of building energy performance, focusing at first on the reliable assessment of building intrinsic performances (e.g. using inverse modelling). The proposed approaches shall be more reliable as well as cost-effective and compliant with relevant EU standards<sup>14</sup>, in order to allow for an EU-wide deployment. Such approaches shall rely on the combination of existing and proven technology components (starting from TRL 6-7, please see part G of the General Annexes) with well-structured methodologies and protocols that can lead to the definition of new certification schemes. They could also consider implications when using EPCs in building passports and renovation roadmaps.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 and 2.5 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 contribute to the PPP on Energy-efficient Buildings.

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

- Improved user-friendliness of EPCs in terms clarity and accuracy of the information provided;
- Enhanced user awareness of building energy efficiency.

Type of action: IA

Scope (2020): Proposals should involve relevant stakeholders (including certification bodies) to develop a roadmap to stimulate and enable next-generation EPCs, with a view to achieve enhanced reliability, cost-effectiveness and compliance with relevant EU standards<sup>15</sup>. In addition, proposals should develop strategies to encourage convergence of EPC practices and tools across the EU. The applicability of the certification schemes should be assessed through a broad set of well-targeted and realistic cases, featuring various locations, building types, climatic conditions and field practices. The assessment will aim at demonstrating the potential of an EU-wide uptake of the certification schemes, along well-defined criteria. Embedding the EPCs in broader concepts such as wider-buildings related databases and one-shop-shops including administrative, financial and supply side information and linking EPCs to related concepts such as buildings passports and individual buildings renovation roadmaps should also be considered.

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.

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<sup>14</sup> CEN (provide ref) standard, EN ISO 52000-1.

<sup>15</sup> CEN standards (provide ref) and EN ISO 52000-1

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:

- Increased convergence of energy performance assessment and certification and uptake and compliance with EU standards;
- Increased rate of application and compliance of EPCs in a defined region.

Type of action: CSA

## **2. Energy efficient industry and services**

### ***LC-SC3-EE-6-2018-2019-2020: Business case for industrial excess heat/cold recovery***

Specific challenge: Energy and fuels represent an important part of the production costs in several Resource and Energy Intensive Industries (REII). While a lot of technical progress has already been done in REII to reduce the energy consumption of the main industrial processes, significant parts of the input-energy are still lost in the form of excess heat/cold by gas, liquid or solid streams. Wide-scale deployment of industrial excess heat/cold recovery is hindered, among others, by the lack of financial/ economic justification for the required equipment and, at times, by the limited industrial applicability (i.e. process re-integration). Often, it is forgotten that directly or after an intermediate transformation step, the sources of heat/cold losses of a given industry can be a valuable resource for other industries or could be of commercial interest for the excess heat/cold producer.

Scope (2018): Cost-benefit models for industrial waste heat/cold recovery:

Proposals should develop integrated cost-benefit simulation tools that, based on the characterization of processes, heat/cold streams and other relevant variables, can determine the best utilisation options of recovered excess heat/cold and/ or surplus renewable energy from industrial or other sources, considering energy efficiency as well as possibilities to contribute to efficient use/system integration of renewable energy sources through e.g. heat/cold storage and flexible production.

The proposals are expected to put forward and validate simulation tools that would allow industrial sites/parks to determine the most financial attractive option for using their recovered excess heat/cold and/or surplus renewable energy. This should be based on, inter-alia, excess heat/cold recovery costs (including equipment and process adaptation), retail and/ or whole sale energy prices, (new contracts) administrative and legal costs, (external connecting) infrastructure costs, internal and external demand, excess heat/cold as source of flexibility in electricity system. Other relevant variables should also be included, inter-alia, characterisation of barriers and opportunities on the DHC side (e.g. competition with other heat/cold sources, thermal storage, regulatory conditions). The simulation tools are expected to be flexible enough to allow a large number of different types of industrial sites/ parks to use it, i.e. should allow all energy intensive process characterizations irrespective of the industrial sector.

Proposals are expected to look at relevant business models for the collaboration outside the plant/industrial park and have strong communication and dissemination components in order to reach many industries, large private facilities and public authorities.

This topic will contribute to the PPP on Sustainable Process Industry through Resource and Energy Efficiency (SPIRE).

The activities are expected to be implemented in the range of TRL 4-7 (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.

Expected impact: Proposals are expected to demonstrate and support with adequate baselines and calculations the impacts listed below, using quantified indicators and targets wherever possible:

- Accurate prediction and holistic modelling of industrial excess heat/cold and/or surplus renewable energy from industrial or other sources from different geographical and market settings;
- Better impact of the various factors/ variables on the cost-benefits of industrial excess heat/cold and/or surplus renewable energy from industrial or other sources;
- Valorisation in assessments of cost-benefit of industrial excess heat/cold and/or surplus renewable energy from industrial or other sources;
- Number of industrial sectors/ sites/ parks, public authorities (including energy agencies), large private facilities (e.g. sport and shopping centres, non-energy intensive industrial parks) and even DHC operators aware, interested and supporting the implementation of excess heat/cold and/or surplus renewable energy from industrial or other sources recovery/use for process re-integration or commercial use, depending on the outcome of the simulations.

Type of action: IA

Scope (2019): Symbiosis in industrial parks and clusters- non-technological barriers

Proposals should improve the energy efficiency of industrial parks districts and clusters by unlocking the market potential and supporting the demand and offer of high-quality energy services by addressing at least one of the following:

- The development and testing of instruments facilitating, at customer/ business level, the actual implementation of energy cooperation such as setting up appropriate process and business organisation, operation and plant design, cooperation mechanisms, related contractual and financial arrangements, better planning, good practices. Proposals need to include capacity building activities such as skills development and engagement of senior and executive management (e.g., CEO, CFO, energy managers) of companies from industrial parks and other related stakeholders.
- The development and testing of replicable business models and service concepts, at service provider level (i.e. ESCOs or other relevant 3rd party organisations), for joint energy services such as identification of horizontal energy services attractive for businesses, identification of the most relevant innovative technical solutions, setting up contractual and financial arrangements, best practices, cost-reduction models. Proposals need to include capacity building activities such as sharing skills, know-how and specific expertise of ESCOs or other 3rd party organisations that would boost the market uptake for such joint energy services contracting in industrial parks.

Proposals need to also address legal issues in order to adapt regulatory and legal frameworks at local, regional and national level. Issues related to the sustainability of the proposed symbiosis in case one or more of the involved parties are changing activity (including leaving the park) should be taken into account. Proposals are expected to ensure applicability of the solutions to other industrial parks/ business sectors while strong communication and dissemination components will be needed in order to reach many industries, industrial park managers and ESCOs.

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, depending on the scope addressed, the impacts listed below, using quantified indicators and targets wherever possible::

- Primary energy savings triggered by the project (in GWh/year per million Euro of EU funding);
- Investments in sustainable energy triggered by the project (million Euro of investments per million Euro of EU funding);
- Number of industrial parks where businesses commit to energy cooperation;
- Number of relevant stakeholders (e.g., ESCOs, industrial park managers) aware of and/or interested in/ implementing joint energy services (in hundreds of stakeholders per million Euro of EU funding);
- Number of policies and legal frameworks created and/ or adapted to facilitate energy cooperation among businesses.

Type of action: CSA

Scope (2020): Linking buildings and industry – addressing technology and non-technology barriers:

Projects should demonstrate both technical feasibility and economic viability of industrial excess heat/cold recovery and reuse in district heating and cooling networks. The technology-related challenge is to integrate and optimise variable flows (also in terms of temperatures) from a combination of excess heat/cold sources and/or surplus renewable energy supply sources to meet the constant heat demand in buildings. The projects address non-technological barriers which prevents the recovery of excess sources of thermal energy and/or surplus renewable energy from industries and from other sources (when relevant) to use it in district H&C networks. Proposals should involve local authorities and should build on local heat maps.

By promoting excess heat/cold reutilisation in the most cost-effective way, this topic responds to the need of saving primary energy in the process industry as identified in the roadmap of the SPIRE cPPP (Sustainable Process Industry through Resource and Energy Efficiency contractual Public-Private Partnership).

Projects are expected to bring the proposed technologies to TRL level 8-9 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 4-5 million would allow this specific challenge to be addressed appropriately.

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

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

- Primary Energy savings triggered by the project (in GWh/year per million Euro of EU funding);
- Investments in sustainable energy triggered by the project (million Euro of investments per million Euro of EU funding);
- Increase of share of excess heat/cold captured and utilised in DHC;
- Scale of replicability potential of the proposed solutions.

Type of action: IA

### ***LC-SC3-EE-7-2020: Increasing energy efficiency of small data centres***

Specific Challenge: The demand for data processing is expected to grow in the coming years. Consolidation is quickly replacing a multitude of small, remote and inefficient data centres with big and more resource and energy efficient data centres. This tendency however does not address specific delay- and security-sensitive small data centres. Moreover the emergence of edge computing, Internet of Things and Software Defined Networks (Network Function Virtualisation) will increase the amount of smaller "data centres" at the edge of the network. These micro data centres should become more energy efficient and should maximise where possible the integration of variable renewable energy sources combined with energy storage. As far as the bigger data centres are concerned, the European players are mainly active in the so-called colocation market. The data centres sustainability actions so far have not addressed these data centres in which the data centre owner does not have control on the IT equipment and thus cannot optimise its performance and efficiency in a holistic manner with the cooling and the other data centre aspects.

Scope:

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 variable renewable energy sources;
- elimination of unnecessary repeated power conversions (AC/DC);
- use of ICT equipment all working in a wider range of temperatures (to mitigate cooling and airflow needs in data centres but also heating needs in telecommunication cabinets/booths in the field) etc.;
- energy storage solutions.

Proposals may include the development of business models to trade heat, cold, electricity or energy security and storage. Proposals could build upon the results of previous projects<sup>16</sup>. Proposals should focus on new and existing small edge or sensitive (delay and security) data centres (indicatively up to 200 kW IT load) and collocation data centres. The solutions should be brought to TRL level 8 (please see part G of the General Annexes) and include at least three non-lab pilots.

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, using quantified indicators and targets wherever possible:

- Bring data centre specific innovative energy efficiency technologies and solutions, already developed by research projects, to market faster and cheaper;
- Achieve a high share of the existing data centre energy consumption covered by sustainable energy resources;
- Reaching a Power Usage Effectiveness (PUE) lower than the best solutions in a given location<sup>17</sup>.

**Type of Action:** IA

#### ***LC-SC3-EE-8-2018-2019: Capacity building programmes to support implementation of energy audits***

**Specific challenge:** The Energy Efficiency Directive, in its art.8, requires Member States to develop programmes encouraging SMEs to undergo energy audits and to implement the recommended energy-saving measures. SMEs represent enormous energy saving potential. However, the lack of expertise, time and capital, including energy audit supporting scheme, often prevents SMEs from implementing energy conversation measures or from getting access to the energy services market.

The effectiveness of energy audit recommendations is influenced by people's behaviours and the improvement of enterprises' energy cultures. The availability of reliable energy consumption data is of utmost importance to monitor the impact of energy saving measures and behaviours. The actions should lead SMEs to become fully aware of the multiple benefits resulting from energy audits as well as facilitating their actual implementation. Moreover, capacity building programmes should also support implementation of the recommended energy-saving measures both for small and large enterprises.

**Scope:** Proposals should focus on one, or more, of the following issues:

- Staff trainings and capacity buildings programmes, facilitating SMEs to undergo energy audits and to implement the recommended energy-saving measures, shall be developed according to SMEs specificities (size, sectors, lifetime of the company etc.)

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<sup>16</sup> FP7-Smartcities Call 2013 (namely RenewIT, DC4Cities, Dolfin, Genic, GreenDataNet, GEYSER), H2020 EE20 Call 2017

<sup>17</sup> Energy efficient IT equipment should be used for the calculation of the PUE in order to avoid distortion and manipulation of the achieved PUE value

and highlighting the financial aspects. Programmes should aim at bridging the gap between demand and supply side (SMEs, auditors, finance institutions, managing authorities of supporting schemes). An active participation of both managerial and operational staff must be ensured. The proposed solution should be tailored to national/local conditions in order to ensure the effective uptake by the SMEs (a EU-wide good practice dissemination tools seems to be of less relevance for instance).

- Capacity building to support the take-up of audits recommendations and undertake the actions necessary to reduce energy consumption (maintenance or investments in new equipment but possibly also behavioural actions) in the companies required to undergo energy audits (large enterprises). Development and implementation of corporate policy measures involving all actors (from decision makers/corporate board members to employees in each department) willing to undertake more efficient energy-related actions (motivations, behaviour change, mitigation of perceived risks and barriers). Evaluation of the total costs of building investments, in terms of financial, environmental and health impact. Initiatives supporting Member States in empowering or establishing national supporting schemes for SMEs providing appropriate incentives to undergo energy audits and/or to implement the recommended energy-saving measures.

Proposals should demonstrate how the proposed activities will be continued commercially beyond the project lifetime. Involvement of relevant multiplier organisations is also 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: Proposals are expected to demonstrate, using quantified indicators and targets wherever possible:

- Primary energy savings triggered by the project (in GWh/year per million Euro of EU funding);
- Investments in sustainable energy triggered by the project (million Euro of investments 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 schemes;
- 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;
- Policies and strategies created/adapted at national level (to be measured in number of initiatives/actions taken to improve/create audit supporting schemes and/or number of SMEs supported in the implementation of energy audit).

Type of action: CSA

### **3. Energy efficiency is an investment**

### ***LC-SC3-EE-9-2018-2019: Innovative financing for energy efficiency investments***

**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. Innovative financing schemes for energy efficiency aim to progressively maximise the leverage ratio of public funds to private finance.

**Scope:** Proposals should address the development or replication and implementation of innovative financing schemes for energy efficiency investments. They can involve different types of organisations, ownership structures and financing models such as dedicated credit lines; guarantee facilities; factoring/forfeiting schemes; on-bill (e.g. utility-financed) 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; financing solutions integrating existing market-based instruments relevant for energy efficiency (e.g. carbon finance instruments, including those under the European Emissions Trading System; energy efficiency obligations, including white certificates; etc.); 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. These schemes should address the provision of finance as well as the structuring of demand, in particular at regional/national level, and target specific areas (e.g. energy-intensive industries). Proposals should justify how the proposed schemes complement already available funding and how they are tailored and innovative for the targeted regions and market segments; as well as clearly demonstrate the potential business case and financial viability of the scheme (including investment sizes targeted, expected savings, transaction and management costs, expected returns etc.).

Proposals should address one or more of the following points:

- Establishment of new innovative, operational financing schemes;
- Replication of solutions developed and implemented under various project development assistance (PDA) facilities under the Horizon 2020 and Intelligent Energy Europe programmes (including MLEI PDA or ELENA of the European Investment Bank);
- Establishment of regional/national aggregators which are able to develop large (standardized) project pipelines;
- Creation of EU or regional/national energy efficiency investment roundtables/platforms to organise dialogue with and between the relevant stakeholders and (among others) develop roadmaps, propose improvements in the legal frameworks and develop template documents and contracts leading to a better understanding of the market. Proposals must include a clear action plan to communicate across Europe towards potential replicators.

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:**

- Proposals are expected to demonstrate, depending on the scope addressed, the impacts listed below, using quantified indicators and targets wherever possible: Primary Energy savings triggered by the project within its duration (in GWh/year per million Euro of EU funding);

- Investments in sustainable energy triggered by the project (million Euro of investments per million Euro of EU funding);
- Delivery of innovative financing schemes that are operational and ready to finance energy efficiency investments;
- Regional/national aggregators with demonstrated/traceable capacity to set up large-scale pipeline of (standardized) sustainable energy investments (in terms of number of and/or amount of investment);
- EU or regional/national energy efficiency investment roundtables/platforms providing a comprehensive range of support and/or services to facilitate access to energy efficiency finance.

Type of action: CSA

### ***LC-SC3-EE-10-2018-2019-2020: Mainstreaming energy efficiency finance***

Specific challenge: Energy efficiency is not yet considered as an attractive investment by the financial sector, which limits the possibility to use external private finance on top of equity of project owners and available public funding. The lack of statistical data on the actual energy and costs savings achieved by energy efficiency investment projects, as well as on payment default rates, results in financial institutions attributing high risk premiums on energy efficiency investments.

Energy efficiency represents high transaction costs for rather small investments, which is not attractive. Technical and legal standardisation is highly needed at all steps of the investment value chain in order to simplify transactions and increase the confidence of financial institutions. The lack of standardisation of projects also prevents securitisation of energy efficiency assets (loans or equity) so that financial institutions are not able to resell their debt on the capital markets<sup>18</sup>.

Whereas energy efficiency investments are usually expected to be paid back exclusively through the reduction of the energy bill, there is increasing evidence that non-energy benefits play a key role in the decision to invest in energy efficiency. This includes for instance increased building value, lower turnover or vacancy rates etc. These benefits need to be quantified through data collection and monetised in order to evolve the parameters used by financiers to assess an energy efficiency investment.

Scope: Proposals should address at least one of the following issues:

- Development, demonstration and promotion of frameworks for the standardisation and benchmarking of sustainable energy investments. This could include for example, but not exclusively, 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 for energy efficiency based financial products. Proposals integrated in a broader approach such as socially responsible investment should focus on the energy component;

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<sup>18</sup> A successful example of standardisation enabling securitisation is the PACE market in the USA

- Capacity building for banks and investors, in particular on underwriting of sustainable energy investment;
- 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 integration of non-energy benefits in project valuation, in particular in the building sector, leading to evolution of existing financial products or creation of new targeted products;
- 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;
- Exploring the impact of revised risk ratings for energy efficiency on financial regulations under Basel II.

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: Proposals are expected to demonstrate, depending on the scope addressed, the impacts listed below, using quantified indicators and targets wherever possible:

- Number of financial institutions and other stakeholders reached as well as their potential volume of investment concerned;
- 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 (in million Euro of investment within 5 years after the end of the project);
- Primary energy savings triggered by the project (in GWh/year per million Euro of EU funding);
- Investments in sustainable energy triggered by the project (million Euro of investments per million Euro of EU funding).

Type of action: CSA

### ***LC-SC3-EE-11-2018-2019-2020: Aggregation - Project Development Assistance***

Specific challenge: 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 realised in particular where projects introduce innovation to the market regarding project aggregation and financing solutions minimising transaction costs and engaging the private finance community. EU added value could also be realised 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, large property owners and services/industry. The action will support building technical, economic and legal expertise needed for project development and leading to the launch of concrete investments, which are the final aim and deliverable of the project.

The PDA focusses on the following sectors:

- existing public and private buildings including social housing, with the aim to significantly decrease energy consumption in heat and electricity;
- energy efficiency of water infrastructures operation (e.g. pumping, treatment);
- energy efficiency in urban transport (such as highly efficient transport fleets, efficient freight logistics in urban areas, e-mobility and modal change and shift); and
- energy efficiency in existing public infrastructures such as street lighting, district heating/cooling and water/wastewater services.

The proposed investments will have to be launched before the end of the action which means that projects should result in signed contracts for sustainable energy investments to that effect, e.g. construction works, energy performance contracts, turnkey contracts.

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 include the following features:

- an exemplary/showcase dimension in their ambition to reduce energy consumption and/or in the size of the expected investments;
- 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);
- demonstrate a high degree of replicability and include a clear action plan to communicate experiences and results towards potential replicators across the EU;
- build on the experiences from previous PDA projects .

This PDA facility focuses on small and medium-sized energy investments of at least EUR 7.5 million to EUR 50 million. Large scale investments are covered by the ELENA facility.

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:** Proposals are expected to demonstrate, depending on the scope addressed, the impacts listed below, using quantified indicators and targets wherever possible:

- Delivery of a series of sustainable energy investment projects and innovative financing solutions and/or 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.

### ***LC-SC3-EE-12-2019-2020: Innovation procurement for energy efficiency***

Specific challenge: Public procurement of innovation, allows public bodies at national, local and regional level to purchase solutions that meet exactly their needs. At the same time it opens up the market for Small and Medium-sized Enterprises that have the required agility and flexibility to respond to those needs. As a result, public bodies are able to deliver more efficient public services of a higher quality, with lower energy consumption at lower life-cycle costs. The potential of innovation procurement has been proven in ICT, health and mobility, but remains largely untapped in the field of energy-efficiency.

Scope: Actions should enable a group of procurers (buyers group) to undertake a PPI procurement for smart and integrated innovative solutions for, products, and/or services, and/or buildings which are not yet available on a large-scale commercial basis, and which have an overall energy performance level that is better than the best (aggregated) level for (a combination of) products and/or services and/or buildings that are readily available on the market. Proposals are encouraged to address wider socio-economic challenges, such as energy poverty reduction. The innovative solutions procured by all procurers in the buyers group must have the same core functionality and performance characteristics, but may have additional 'local' functionality due to differences in the local context of each individual procurer. Actions should lead to the first application/commercialization 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. Other entities (e.g. public procurement expertise centres, end-users, certification bodies, private/NGO procurers that provide services of public interest and share the same procurement need) whose participation is well justified may participate in additional activities that clearly add value to the action. Proposals should include a clear action plan to communicate experiences and results towards potential replicators across the EU.

Applicants should refer to the part D and E of the General Annexes to this Work Programme.

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 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 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:

- Prepare and implement the PPI procurement and PPI contracts within the timeframe of the project to ensure the first application/commercialization of the innovative solutions;

- Energy performance levels of new buildings should reach at least NZEB performance levels. For existing buildings, energy savings equal to deep renovation or NZEB levels should be reached, using innovative solutions. Products and services, should demonstrate at least 25% better performance in terms of energy efficiency than the available performance levels;
- Improved quality and efficiency of public services with breakthrough solutions for tackling socio-economic challenges (such as energy-poverty reduction);
- Increased investments in innovative products, services and buildings, with higher energy-efficiency levels than the best available on the market;
- Increased opportunities for SME's and local economy.

Type of action: PPI

#### **4. Energy efficiency is an energy source**

***LC-SC3-EE-13-2018-2020: Enabling next-generation of smart energy services valorising energy efficiency as energy resource***

Specific challenge: Energy Efficiency services (e.g. Energy Performance Contracting (EPC)) are available on the market already for quite some time. However, there is a big untapped potential in sectors and with actors not yet engaged in services triggering energy, CO2 and cost savings. At the same time, new technologies have emerged opening the door for new types of services which use ICT to better control and steer energy consumption according to market and system needs and to the availability of renewable energy; others are able to integrate energy services with non-energy benefits such as comfort. By bundling various services and benefits, additional target groups, sectors and financial resources can be accessed. Actions are also needed to structure and label the quality of demand side service providers (like ESCOs and aggregators) and improve their accessibility for end energy users. Finally, ICT-tools and big data generated by smart meters, smart devices and sensors will help monitor and verify energy savings and flexibility and thus provide for appropriate remuneration of optimised consumption. A particular challenge for energy services of this kind is that while they aim to involve different services and benefits towards increasing their viability, they should nevertheless result in real, measurable energy savings.

Scope (2018): Projects should allow different market actors to get together and focus on developing integrated concepts and models which

- enhance and refine successful energy performance contracting models and/or;
- include pay-for-performance schemes and/or;
- engage new sectors and actors and/or;
- integrate energy efficiency services with distributed generation and demand response and including storage/hybrid energy systems; these should be endorsed by relevant stakeholders and validated (for example tested around existing projects or projects under development).

Proposed actions should cover at least two (but not necessarily all) of the relevant areas and aspects identified below:

- Energy service models (like EPC) and services that target new sectors and new actors;
- Business models which work equally for energy efficiency and other services, building on contractual arrangements across different actors (ESCOs, aggregators, DSOs, obliged parties under the Energy Efficiency Obligation Schemes implementing art 7 EED and eventually the consumers) which traditionally cover different use cases business interests and different revenue;
- "Pay for performance"-schemes which focus on permanently reducing power consumption in particular at peak times, thus attracting new sources of financing;
- The use of 'big data' generated by smart meters, equipment, sensors and tools for standardised processes enabling a more accurate and dynamic measurement and verification of energy savings and flexible consumption, also in order to ex-ante identify and develop business opportunities;
- Additional non-energy features that support the up-take of innovative energy efficiency services and technologies;
- Improving the accessibility and quality of demand side service providers while enhancing their access to the market.

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

Scope (2020): Projects should focus on demonstrating and testing innovative services in a real environment, across several market segments and across different actors in the value chain. To be economically viable, these services need to be able to rely on sound measurement and verification methodologies. They should cover several but not necessarily all of the relevant areas and aspects identified above, blending in innovative manner different revenue streams coming from different market segments and they should in all cases include innovative verification and monitoring measures.

Projects can include investment costs for the necessary infrastructure/equipment. They should demonstrate that the tested business models and services are self-sustainable after the end of the project. The upfront investments in energy efficiency measures (e.g. upgrading of building energy performance) and in smart building systems should be paid back at least in part by revenues coming from energy savings and remunerated flexibility.

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

Where available and appropriate, the actions should build on the results of the DT-10-2018: Internet of Things for Energy: interoperable smart homes & grids, ICT-16-2019-20: HPC and Big Data enabled Large-scale Test-beds and Applications and LC-SC3-ES-6-2018-2020: TSO-DSO-consumers: Large-scale demonstrations of cross-border markets for innovative grid services.

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

- Primary Energy savings triggered by the project (in GWh/year per million Euro of EU funding);

- Investments in sustainable energy triggered by the project (million Euro of investments per million Euro of EU funding);
- Improved viability of innovative energy services.

In addition, proposals are expected to demonstrate, if relevant, depending on the area they address, the impacts listed below, using quantified indicators and targets wherever possible:

- A growing offer and up-take of services that combine energy efficiency with other services, technologies and non-energy benefits;
- A growing up-take of innovative data gathering and processing methods in the monitoring and verification of energy savings and flexibility;
- An effective up-take of energy saving services, like advanced energy performance contracting, across actors and sectors not yet engaged in these services;
- The application of methods and concepts to ensure that: (i) innovative energy services are reliable and verifiable, (ii) service providers are trustworthy and accessible.

Type of action: CSA (2018), IA (2020)

### ***LC-SC3-EE-14-2018-2019-2020: Socio-economic research conceptualising and modelling energy efficiency and energy demand***

Specific challenge: In the European Union Strategy, Energy Efficiency was recognised as a resource in its own right which should be enabled to compete on equal terms with generation capacity and to have primary consideration across all policies<sup>19</sup>. However, the structure of energy demand as well as the real value and the (energy and non-energy) impacts of energy efficiency are still not well understood with the effect that benefits of energy efficiency are not sufficiently taken into account in financial and political decision making, and planning.

The topic addresses three different dimensions of this challenge with the aim to trigger actions which

1. make the energy efficiency first principle more operational (2018);
2. substantiate the demand side aspects in energy modelling (2019);
3. improve the understanding of non-energy benefits linked to energy efficiency (2020).

Scope (2018): The research projects should help to make the Energy Efficiency First principle more concrete and operational and to better understand its relevance for energy demand and supply and its broader impacts across sectors and markets. In particular, it needs to be analysed how energy efficiency programmes can compete in reality with supply side investments (e.g. new generation capacities or import capacities) including at the level of countries and having in mind limited public budgets. It would also be necessary to describe and assess how it interacts with and correlates to other policy objectives, at a policy level as well as at the level of implementation.

Actions which conceptualise assess the impacts and model the energy efficiency first principle, in particular as regards:

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<sup>19</sup> Communication from the Commission A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy /\* COM/2015/080 final

- its role and value in the energy system (e.g. for planning of generation assets and networks adequacy etc.) and the energy market (participation in capacity market, participation and impact on prices and costs on wholesale and balancing/reserve markets);
- its role and value in financing decisions;
- its economic and social impacts;
- its correlation and interaction with other policy objectives (e.g. renewable energy, demand response);
- existing best practices worldwide where energy efficiency projects are given priority over supply side measures.

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

Expected Impact: Actions are expected to support policies aiming to promote and implement the "energy efficiency first-principle" based on a sound assessment of the concept and its impacts. To this end, actions should lead to a better understanding of:

- all relevant aspects linked to the "energy efficiency first-principle";
- its impacts (e.g. technical, economic, socio-economic, and ecological etc.) on the relevant sectors and markets;
- its potential across the different policy areas and sectors;
- its consideration and valorisation in modelling and assessments; and
- its interaction with other policy objectives both at policy level and at the level of concrete application (e.g. design of buildings).

Type of action: RIA

Scope (2019): The aim of the project is to deepen the demand side-related parameters in existing models and to include new aspects and data sources (e.g. by tapping DSOs modelling for forecasting of distributed loads). In general, it is to be expected that the introduction of smart meters and smart equipment will lead to more accurate consumption data providing for a more holistic mapping of the demand side and thus for better projections inside energy policy development.

The project should complement the existing demand side energy models by developing multiple-agent energy models and/or modelling segments and/or developing methodologies on how to improve and enhance the demand side aspects in modelling.

These models and/or methodologies should:

- be compatible with the energy models most commonly used at European level;
- model more accurately those aspects not yet sufficiently considered in the existing models;
- make use of new data sources, including big data as for example generated by smart meters, smart buildings and smart equipment;
- identify and refine the structure and patterns of demand and how it will develop;

- contribute to an enhanced demand-side model to be consistently used at European level.

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

Expected impact:

- More accurate and holistic mapping and modelling of the demand side and to a better assessment of energy consumption trends for different categories of economic agents.
- Better assessment of demand-side policy needs at European level.

Type of action: RIA

Scope (2020):

The aim of the research action is to explain the transition of Energy Efficiency from a "hidden fuel" to the "first fuel" and make the value of the externalities triggered by Energy Efficiency investments more visible across a variety of areas. The analysis should go beyond the traditional measures of reducing energy demand and greenhouse gas (GHG) emissions; it should include externalities relating to other policies such as public health.

Actions should build upon the existing methodological frameworks and the work already developed in this field in order to:

- create economic models and other instruments able to quantify and when possible monetise direct and indirect non-energy impacts (both positive and negative) of energy efficiency investments, taking into account all possible challenges (e.g. rebound effect, double counting, etc.);
- provide a simplified and evidence-based tool which can help policy makers at different levels in defining optimised short-term cost-effective policies as well as long-term strategies in the energy domain;
- disseminate the concept to households, businesses and financing institutions in order to increase awareness and investments in Energy Efficiency improvements.

The Commission considers that proposals requesting a contribution of around 1 million EUR 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 support policies aiming to foster investments in Energy Efficiency Improvements;

- increase awareness on multiple benefits among policy makers in other-than-energy policy departments e.g. using a simplified language in order to allow their inclusion in future policy developments, impact assessments and evaluations;
- increased awareness among households, businesses and financing institutions;  
evidenced for example by the number of public officers, private actors and other stakeholders involved and reached out to, number of peer-reviewed articles produced, or references to impact assessments, strategy papers or other policy documents.

Type of action: RIA

## **5. Support for policy-driven innovations**

### ***LC-SC3-EE-15-2018: New energy label driving and boosting innovation in products energy efficiency***

Specific challenge: The energy label is a key driver to innovation in the energy efficiency area. For more than 20 years we are observing the tangible results of the transformation of the European market where only the products with the highest energy efficiency parameters and innovative solutions to save energy are being commercialised. The energy label stimulates a real competition in innovation among products manufacturers. However the current energy label has a closed scale from A+++ to D, so once the majority of products reach the highest classes, the label no longer stimulates further innovation. Therefore, the Commission has proposed that, in future, labels will be 'rescaled' (as well as go back to A-G scale), i.e. existing products will be re-categorised in lower classes so that the top classes are empty and provide new stimulus for innovation. The 'empty top-class' label will be the strongest and continuous innovation trigger. Rescaling of labels would take place approximately every ten years or faster, if technology development and innovation has been faster than expected. This rescaling, will be a challenging operation in terms of organisation and provision of information to the concerned market actors, requiring technical guidance, communication and training campaigns, including during the transitional periods<sup>20</sup> in order that the new scale is correctly applied by manufacturers leaving enough space for future innovations. Customers' confusion should be avoided by replacing labels displayed on the affected products within a short timeframe in order to ensure consumer choice to be directed to the highest class innovative products.

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

1. Raise the capacity of manufacturers and retailers (e.g. through a comprehensive training methodology, involving a series of hands-on applications in each Member State) to fulfil their obligations providing and displaying respectively the correct label at the point of sale;
2. Develop and roll out tailored and effective actions focusing on awareness-raising and information campaigns to alert market actors (businesses, public procurement personnel, consumers etc.) of label rescaling, with a view to increasing understanding of labels and routing purchase decisions towards higher efficiency products. These actions should also address any additional references that may exist on the rescaled label (e.g. QR code);
3. Exchange of best practices in relation to these campaigns, including through the recommendation of common key messages to the respective target groups.

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<sup>20</sup> A period during which old (before the rescaling) and new rescaled labels for the same products would both be present in shops.

All relevant stakeholders necessary for the successful implementation of the action should be involved.

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: Proposals are expected to demonstrate, depending on the scope addressed, the impacts listed below, using quantified indicators and targets wherever possible:

- Primary energy savings triggered by the project within its duration (in GWh/year per million Euro of EU funding);
- Investments in sustainable energy triggered by the project (million Euro of investments per million Euro of EU funding);
- Number of stakeholders (e.g. public procurement personnel, businesses) informed by actions aiming at improving the understanding of rescaled labels, minimising any risk of confusion (at least 5 million stakeholders per million Euro of EU funding);
- Number of manufacturers, suppliers and retailers engaged by actions aiming at improving their understanding of rescaled labels, minimising the risk of confusion (at least 5 000 market actors per million Euro of EU funding);
- Reduced compliance costs, maximise legal certainty and minimise errors during the transition periods for suppliers and dealers.

Type of Action: CSA

***LC-SC3-EE-16-2018-2019-2020: Supporting public authorities to implement the Energy Union***

Specific challenge: The delivery of the Energy Union targets requires the full engagement of the public sector at all governance levels.

Local and regional public authorities have a crucial role in setting ambitious energy efficiency strategies, for instance in the framework of the Covenant of Mayors for Climate and Energy and Smart Cities and Communities. The political commitment at local level should be enhanced and the focus should turn to implementation and effective monitoring of concrete energy efficiency solutions and actions, which can contribute to modernise and decarbonise the European economy.

Support should continue and be reinforced in building capacity of public authorities and empowering them to take up their role of energy transition leaders at regional and local level, by permanently improving their skills of public entrepreneurs and supporters of market transformation towards more efficient energy systems.

At national level, the Energy Efficiency Directive has triggered numerous positive developments in the Member States by setting targets to incentivise and enable investment in energy efficiency programmes across all sectors. However, Member States have yet to fully implement the Directive and additional support in building capacity and know-how is needed.

Scope :

a) Support to local and regional public authorities

Proposers should aim to focus their proposed action on one of the following points:

- Innovative approaches to facilitate the implementation of existing energy and climate plans (e.g. SEAPs/SECAPs or similar plans) at scale across municipalities, focussing on sectors with high energy savings potentials. Actions should lead to the development of investment concepts, demonstrate a clear replicability of the approach across Europe and link closely to the Covenant of Mayors and/or Smart Cities and Communities initiatives.
- Deliver higher quality and consistency of energy efficiency measures implemented through enhanced coordination of different administrative levels. Actions should lead to politically approved and jointly applied monitoring and verification schemes of energy efficiency measures across local and regional authorities, enhanced and better coordination of the energy efficiency measures implemented and more efficient use of public spending in energy efficiency.
- Innovative ways to enable public engagement in the energy transition, developing interface capacities within public authorities to engage with civil society.
- Deliver large-scale and action-oriented peer-to-peer learning programmes targeting cities and/or regions, with a strong replication potential European-wide.

Actions should deliver public entrepreneurs able to drive the sustainable energy transition in their respective territories within the Covenant Mayors and beyond.

Proposals should develop transparent, effective and compelling programmes, building on existing initiatives and real needs and ensure embedded conditionalities such as institutionalisation of the skill base and impact monitoring,

#### b) Supporting the delivery of the Energy Efficiency Directive

Support will be provided to actions that are assisting Member States to fulfil their obligations under the Energy Efficiency Directive and help with its efficient implementation taking into account existing effective practices and experiences from across Europe. Actions may address, for example, the harmonisation of energy savings calculations under Article 3, implementing Energy Efficiency Obligation Schemes or alternative measures and setting up effective and consistent monitoring and verification systems under Article 7.

Proposals should link into existing, relevant initiatives such as ManagEnergy and target specific sector with high energy saving potential such as buildings, transport mobility, heating and cooling, or water infrastructure operation etc., as seen relevant by applicants.

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 impacts: Proposals are expected to demonstrate, depending on the scope addressed, the impacts listed below, using quantified indicators and targets wherever possible:

- Primary energy savings, renewable energy production and investments in sustainable energy triggered in the territory of participating parties by the project (respectively in GWh/year and million Euro of investments per million Euro of EU funding);
- Number of public officers with improved capacity/skills;
- Number of policies influenced through the action;
- Number of investment concepts developed;

- Number of Member States with improved implementation of Art 7. (Energy Efficiency Obligation schemes or alternative measures) / Energy savings achieved through successfully implemented EEO's or alternative policy measures;
- Number of Members States with improved and consistent monitoring and verification systems for energy savings across governance levels.

Type of action: CSA

## **2. Global leadership in renewables**

The Energy Union Strategy has set the target for the EU to achieve global leadership in renewable energies. Increased R&I efforts for renewable energy are indispensable hence renewables are identified as a core R&I priority in the Energy Union Strategy and the "Accelerating Clean Energy Innovation" Communication. The "Clean Energy for all Europeans" package underpins the EU's ambition by a number of legislative proposals and non-legislative initiatives, notably the recast of the Renewable Energy Directive which creates the enabling framework for Member States to unlock their renewables' potential and collectively reach a share of at least 27 % in the Union final energy consumption by 2030 in a cost-effective way.

The Energy Union priorities, also in the area of renewable energy, are jointly implemented by the stakeholder community, national authorities and the Commission through the key actions of the EU Strategic Energy Technology Plan (SET Plan), notably action 1 ("Performant renewable technologies integrated in the system) and action 2 ("Reduce costs of technologies"). To attain these goals, ambitious R&I targets have been set in agreement with the sectorial stakeholders, for renewable technologies with great potential for cost-reductions, performance improvements and large-scale deployment worldwide – off-shore wind energy, the next generation of solar photovoltaics (PVs), ocean energy, concentrated solar power (CSP), deep geothermal energy and bioenergy. Furthermore, goals were set to strengthen market take-up of renewable fuels needed for sustainable transport solutions. While it is expected that the Member States will take coordinated actions towards the priorities and targets set by the SET-Plan, a strong and concerted effort also from the EU is needed to sustain the technological and economic leading position in some renewable technologies and to catch up in areas where the EU is lagging behind.

Activities included in this call fully reflect the "3 Os strategy" – assuring open science by providing access to relevant previous research results while moving up the TRL scale innovative solutions; providing support opportunities for opening markets to innovative solutions and for turning research results into successful products; being open to the world, proactively exploring international cooperation activities in the precompetitive research phase, and fostering local market adaption via frugal innovation of available technologies for emerging global markets.

The challenge is to create an EU-integrated industrial renewable energy sector which is economically sustainable and competitive in European and global markets in the long-term. For this purpose, this calls supports activities across the full innovation chain, from identifying breakthrough technologies to supporting the entire portfolio of renewable energy technologies at laboratory scale, dedicating support to proof of concept of most promising technologies in a sequenced approach in order to provide each of them with sufficient critical mass, finally supporting market up take introduction with collaborative and not purely

technological activities. It features tailored approaches, taking into account technology-specific challenges, potential, cultural aspects, levels of maturity, risk, and competitive situation.

This call includes 4 lines of interventions:

1. breakthrough technology development,
2. renewable energy solutions for implementation at consumer scale (encompassing generation of energy in all its form, starting from electricity only generation to also encompass combined heating and cooling solutions, from domestic to industrial and district scale),
3. renewable energy solutions for implementation at the energy system level (oriented to reduce the costs of electricity generated, to optimise system operation and improve processes and components manufacturing, to provide flexibility to the system), and
4. renewable fuels for transport (aiming both feedstock and process improvements and supporting road, aviation and shipping sectors in particular).

In addition, specific actions with an international dimension are foreseen, notably in the context of the "Mission Innovation" initiative, including a special focus on adapting emerging renewable energy technologies to the African context by fostering cooperation and concerted actions with the Member States and Associated countries.

## **1. Next Renewable energy solutions**

The focus of these actions is to support research activities aiming at identifying renewable energy breakthroughs that will feed the innovation cycle and become the basis of the next generation of EU technologies.

### ***LC-SC3-RES-1-2018: Developing the next generation of renewable energy technologies***

Specific challenge: The renewable energy technologies that will form the backbone of the energy system by 2030 and 2050 are still at an early stage of development today. Bringing these new energy conversions, new renewable energy concepts and innovative renewable energy uses faster to commercialisation is challenging. These new technologies must not only have a commercial potential but they should also have a lower environmental impact and lower greenhouse gases emissions than the current renewable energy technologies.

Due to the pre-competitive nature of the research activities of this type, particular emphasis is put on including international cooperation opportunities.

Scope: Proposals are expected to bring to TRL 3 or TRL 4 renewable energy technologies that will answer the challenge described. Beside the development of the technology, the proposal will have to clearly address the following related aspects: the potential lower environmental impact, the better resource efficiency, issues related to social acceptance or resistance to new energy technologies, related socioeconomic and livelihood issues.

Support will be given to activities which focus on converting renewable energy sources into an energy vector, or the direct application of renewable energy sources. While proposals addressing any renewable technology are fully eligible, particular attention should be given to:

- innovative heat exchangers using innovative material converting geothermal energy source, improving the overall conversion efficiency and maximizing energy transfer;
- innovative testing methods, design tools, components and structures for the development of the next generation wind energy conversion systems;
- sustainable fuels for energy and transport application through ground-breaking conversion technologies, addressing for example development of novel microorganisms, enzymes, catalysts, and separation techniques, improvement of biomass and microalgae yields, and development of novel technologies of combined indirect and direct artificial photosynthesis with chemical/ biochemical/biological systems;
- innovative inorganic thin-film photovoltaics, increasing performance through micro-concentration.

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

Expected impact: On its completion, the project is expected to advance the knowledge and scientific proofs of the technological feasibility of its concept including the environmental, social and economic benefits. The proposal should show its contribution towards establishing a solid European innovation base and building a sustainable renewable energy system. The proposed solution is expected to contribute to implementing the specific priorities for strengthening the EU leadership on renewables laid out in the Communication for Accelerating Clean Energy Innovation<sup>21</sup>.

Type of action: RIA

#### ***LC-SC3-RES-2-2019: Market-creating innovations***

*This is a pilot to experiment a portfolio management approach to deliver market creating innovations in the areas of transparent photovoltaic windows and bionic leaf.*

*Proving economic feasibility and attract investors as a cost-effective alternative energy source should be shown to fully utilize the potential for breakthrough innovation and market creation that replaces fossil fuels.*

#### ***LC-SC3-RES-3-2020: International Cooperation with USA on alternative renewable fuels for energy and transport***

Specific challenge: Decarbonisation of the energy and transport systems requires the ultimate replacement of fossil fuels in the long-term. International collaboration is mutually beneficial in strategic areas where knowledge can be exchanged. The specific challenge is for Europe to obtain leadership in global development of specific disruptive technologies for the ultimate replacement of fossil fuels

Scope: Proposals shall aim at international cooperation with the USA through coordinated research activities for obtaining advanced biofuels and alternative renewable fuels for energy and transport through artificial photo-synthesis, by addressing:

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<sup>21</sup> COM(2016) 763

- Development of breakthrough artificial photosynthesis technologies in terms of sunlight conversion efficiency for the production of energy carriers (other than electricity) with either de-novo synthetic biological and artificial/biochemical hybrid systems or photo-electro catalysis coupled with CO<sub>2</sub> reduction.

Use of renewable electricity generated by sunlight with PV or CSP to produce the carriers is excluded within this topic.

Grants awarded under this topic will be coordinated and jointly funded with actions run by the respective authorities of USA.

The respective options of Article 2, Article 41.5 and Article 50.3.1 (i) (j) 2 of the Model Grant Agreement will be applied.

Proposals are expected to bring technologies to TRL 3 (please see part G of the General Annexes). The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 5 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: It is expected that the exchange of knowledge through the coordinated research activities will progress the scientific understanding and the technology state-of-the-art and in addition strengthen the European technology base. At the same time, it is expected that the development of sustainable fuels that outperform the best fossil fuel alternatives is accelerated.

The proposed solution will contribute towards Mission Innovation Challenge 4 and 5<sup>22</sup>.

Type of action: RIA

*Special eligibility conditions related to the coordinated projects apply to this topic. Please refer to the call conditions.*

## **2. Renewable energy solutions for implementation at consumer scale**

The focus of these actions will vary, depending on the number of consumers involved, from individual and residential buildings, to industrial sites and district systems. Solutions explored under this line of intervention consider holistically the consumer energy needs, from electricity generation to heating and cooling services, aiming to develop near-zero fossil energy solutions for buildings and districts. The solutions should allow for a significant part of the energy to be consumed at the place of production, fostering the emergence of the energy prosumers and therefore enabling the consumer participation into the energy transformation.

### **Energy generation at building scale**

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<sup>22</sup> <http://mission-innovation.net/our-work/innovation-challenges/sustainable-biofuels-challenge/>

***LC-SC3-RES-4-2018: Renewable energy system integrated at a building or an industrial site***

Specific challenge An increased penetration of renewable energy in the energy mix and the decarbonisation of the heating sector are amongst the most important priorities set in the Energy Union Strategy<sup>23</sup>. To this aim, solutions that integrate several technologies based on one or more renewable energy sources should be made available and the highest possible share of renewable energy should be achieved. This integration requires innovative approaches, due consideration of the implications for the user and a proper assessment of the cost-effectiveness.

Scope: Proposal will provide an integrated package of different renewable energy technologies to cover the electricity, heat and cooling needs of a multi-family residential building or industrial building (in the case of the industrial building, process electricity and process heat and cooling are excluded from the scope).

Because the final application will be operated by users, their needs and requirements are expected to be taken into account and the relevant expertise in terms of social sciences and humanities has to be included in the consortium (this will be evaluated under the 'Impact' criterion).

Proposals are expected to bring the integrated technologies solutions from TRL 3-4 to TRL 4-5 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 to 5 million would allow this 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 develop technology applications that will reduce the dependence on fossil energy for providing electricity, heat and cooling in buildings. Cost competitiveness with traditional solutions is expected to be achieved by 2025 considering also the effect of economies of scale. The proposed solutions will pave the way to the achievements of the technological targets agreed with the sectorial stakeholders in the context of the SET-Plan<sup>24</sup>.

Type of Action: RIA

***LC-SC3-RES-5-2018: Increased performance of technologies for local heating and cooling solutions***

Specific challenge: Renewable and local energy sources have a great potential to drastically reduce the use of primary energy for both heating and cooling in residential and commercial buildings. In order to stimulate the uptake of solutions that harness these sources, it is necessary to make existing technologies more performant and therefore more cost-efficient and attractive for the market. In addition, innovation in resource mapping, monitoring and control tools has the potential to improve the design and the operation of heating and cooling systems thus reducing investments and operation costs and increasing the systems' performance.

Scope: The proposal is expected to address one or more of the following aspects:

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<sup>23</sup> COM(2015) 80

<sup>24</sup> <https://setis.ec.europa.eu/actions-towards-implementing-integrated-set-plan>

- Optimisation of the different components of a renewable heating and cooling system;
- Development of tools and systems to optimize the design and monitoring the different components of a heating and cooling system;
- Development of integrated control systems for smart operation of a heating and cooling system.

The proposed systems will harness renewable, local and constant energy sources to supply heating and cooling in residential and small and larger commercial buildings as they have different heat/cold needs. Residential building includes single houses and apartment blocks.

Proposals are expected to bring the technologies from TRL 5-6 to 6-7 (or higher).

The Commission considers that proposals requesting a contribution from the EU of between EUR 8 to 15 million would allow this 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 lead to either a significant performance increase, in the order of 10-20%, in terms of available heat/cold or to a reduction in the investment and operation costs or to a combination of both aspects, reducing the dependence on fossil energy for heat and cooling in buildings.

Type of Action: IA

***LC-SC3-RES-6-2018: Demonstrate significant cost reduction for built-in PV solutions for "(nearly) Zero Energy Buildings"***

Specific challenge: Built-in photovoltaics (BIPV) need to satisfy multiple building functions such as mechanical rigidity and structural integrity; primary weather impact protection including rain, snow, wind, etc.; energy economy, such as shading, daylighting, thermal insulation; fire protection, noise protection, in addition to architectural and aesthetic considerations, so as to replace roofs, facades and shading devices. At the same time, a control system for building management functions, grid-feeding, self-consumption and local storage needs to be considered.

Scope: Support will be given to: a) new BIPV module concepts to meet these requirements and cost-efficient production techniques reducing their additional cost by 75% by 2030 compared to 2015 levels (<sup>25</sup>*Annex I. BIPV detailed targets*) and; b) demonstration of these concepts into a BIPV energy system that guarantees the building functionalities and energy needs. Proposals are expected to involve multidisciplinary consortia including, among others, the PV manufacturing industry and the building materials industry as well as certification bodies and market actors who are committed to adopting/implementing the results.

Proposals will also address standardization issues.

Proposals are expected to bring the technology from TRL 5-6 to 6-7 (or higher) (please see part G of the General Annexes).

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

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<sup>25</sup> [https://setis.ec.europa.eu/system/files/integrated\\_set-plan/declaration\\_of\\_intent\\_pv.pdf](https://setis.ec.europa.eu/system/files/integrated_set-plan/declaration_of_intent_pv.pdf)

Expected impact: The project is expected to contribute to the implementation of policies towards Zero-Energy Buildings and to the Strategic Target no. 4 of the Declaration of Intent<sup>26</sup> in the context of an Initiative for Global Leadership in PV (SET-Plan Key Actions no. 1&2). By achieving a substantial reduction of the BIPV costs which would trigger the penetration of BIPV in the building sector, they are also expected to contribute to the creation of new opportunities and the diversification of the European manufacturing industry.

Type of Action: IA

### **Renewable energy solutions at the district level**

#### ***LC-SC3-RES-7-2019: Solar Energy in Heat Processes***

Specific challenge: The potential of applying solar energy for industrial purposes is still largely untapped. Using solar energy to provide the heat or cooling necessary to industrial processes that need high reliability and high quality heat and cooling and continuous operation requires innovative advances in solar energy technology. Also, industrial processes might need to be adapted to the use of the solar resource. Industrial actors expect solutions with limited installation, maintenance and operation costs and which are easy to operate.

Scope: Support will be given to solutions that cover the heat and/or cooling demand of one or more industrial processes by means of solar thermal energy. In the case of heat, the process temperature shall be higher than 150°C. Individual industrial sites and/or industrial parks can be addressed.

Proposals are expected to bring the technologies to TRL 4-5 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 to 5 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: An increased decarbonisation of the industrial sector and a significant visibility of the potential of applying solar thermal energy in industrial processes are expected. This will result in reduced dependency of the industrial sector on fossil fuels

Type of Action: RIA

#### ***LC-SC3-RES-8-2019: Combining Renewable Technologies for a Renewable District Heating System***

Specific challenge: There is a large potential to integrate substantial shares of renewable energy in district heating systems. Innovative approaches are needed to exploit this potential in the different geographical regions of Europe, also considering the option of combining two or more renewable energy technologies. The operators and users expect the systems to be reliable and to have limited installation and running costs.

Scope: Support will be given to district heating solutions based on one or more renewable energy technologies that can replace by at least 20% the use of fossil fuels.

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<sup>26</sup> [https://setis.ec.europa.eu/system/files/integrated\\_set-plan/declaration\\_of\\_intent\\_pv.pdf](https://setis.ec.europa.eu/system/files/integrated_set-plan/declaration_of_intent_pv.pdf)

The solutions will be demonstrated in real conditions within an operational district heating system with a thermal capacity higher than 20 MW.

The consortium is expected to engage operators and consumers so that they can contribute for an optimal and cost-effective design.

Proposals are expected to bring the technologies to TRL 6 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 8 to 15 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: A reduced dependency of district heating systems on fossil fuels is expected. The proposed solutions will pave the way to the achievements of the technological targets<sup>27</sup> agreed with the sectorial stakeholders in the context of the SET-Plan.

Type of Action: IA

### **100% Renewable energy supply**

#### ***LC-SC3-RES-9-2020: Next generation of thin-film photovoltaic technologies***

Specific challenge: The rapid expansion of photovoltaic solar energy conversion based on thin films of semiconductors could become subject to constraints arising from materials availability and security. For this reason, the development of alternative thin-film technologies based on earth-abundant elements has become a priority.

Scope: To develop alternative inorganic thin-film technologies that can yield high-efficiency devices through simple processing and based on earth-abundant, low-cost non-toxic materials.

Proposals are expected to bring the technologies up to TRL 5 (please see part G of the General Annexes).

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

Expected impact: The projects are expected to lower the cost and environmental impact, and to significantly increase thin film device efficiency. This will allow for novel applications of PV given increased stability and reliability and a new route for the European PV manufacturing industry. The outcome of successful projects will contribute to achieving the Strategic Targets of the SET-Plan Declaration of Intent in the context of an Initiative for Global Leadership in PV<sup>28</sup>.

Type of Action: RIA

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<sup>27</sup> <https://setis.ec.europa.eu/actions-towards-implementing-integrated-set-plan>

<sup>28</sup> [https://setis.ec.europa.eu/system/files/integrated\\_set-plan/declaration\\_of\\_intent\\_pv.pdf](https://setis.ec.europa.eu/system/files/integrated_set-plan/declaration_of_intent_pv.pdf)

### ***LC-SC3-RES-10-2020: Pre-Commercial Procurement for a 100% Renewable Energy Supply***

Specific challenge: The Commission presented in the November 2016 package of the Energy Union legislations promoting self-consumption to foster the emergence of the energy prosumers and therefore enabling the consumer participation into the energy transformation. The major challenge in achieving this objective is the availability of energy technology systems with technical specifications corresponding to the expectation of the prosumers/consumers in terms of reliability, flexibility, operability and design at affordable costs. Combining renewable energy technologies to achieve this self-consumption with a 100% share of renewable energy consumed requires an innovative approach and full consumer involvement. Therefore a consortium of procurers are the right set of users to provide the necessary requirement for realising, within a district, an efficient and low-cost system for operators and consumers.

Scope: Support will be given to a consortium of procurers for procurement of innovative components and whole system design to deliver to the electricity, heat and cooling needs of an operational district system by means of 100% renewable sources within the scope of the upcoming legislations.

Proposals need to present the jointly identified objectives, indicating how it fits into their mid-to-long term innovation plans, why solutions currently available on the market or under development are not meeting their needs, and put forward concrete targets for the desired functionality/performance improvement in the quality and efficiency of their public services. Activities will include: (1) networking related to preparation, management and coordination and (2) joint research activities related to the validation of PCP strategy.

Participation of district operators and consumers directly in the ideation, design and utilisation of the innovative solutions is considered a fundamental element for an optimal design and therefore the participation of prosumers in the development of the solutions procured is expected.

The solutions to be procured are expected to bring the technologies up to TRL 6 (please see part G of the General Annexes) and have a wide exploitation potential in terms of system sizes, energy consumption, of flexibility, adaptability to different energy resources and operational modes, and geographical applications.

The proposal is expected to provide the required technology components and systems at an affordable cost allowing the procurers of the consortium and others to launch a public procurement for such systems.

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

Expected impact: The impact of proposal is expected to create the technologies and the supply chains allowing the wide dissemination of self-consumption energy systems with high energy efficiency and ease of operation and low-cost for operation and maintenance. These systems are expected to increase the share of renewable energy source in the overall EU energy consumption mix, decrease costs of these systems and create a market.

Type of Action: PCP

### **3. Renewable energy solutions for energy system level implementation**

The focus of these actions is to reduce capital and operational costs, to increase reliability and to provide flexibility to the energy system. Solutions should be implemented at the system level, namely in those cases where the renewable energy that is inserted into the network, is to be transmitted and distributed to the end user and not, or only in minimal part, used for self-consumption.

#### **Reduce costs of key technologies for renewable energy conversion**

##### ***LC-SC3-RES-11-2018: Developing solution to reduce the cost and increase performance of renewable technologies***

Specific challenge: Achieving or maintaining global leadership in renewable energy technology requires that the innovative solutions are affordable at the same time. Therefore cost reductions remain a crucial necessity for existing or new technologies.

Scope: Proposals will address one of the following issues:

- a. Offshore – Floating Wind: Technology development including cost efficient anchoring and mooring system, dynamic cabling, installation techniques, and O&M concepts;
- b. Tidal energy convertors: New type of blades needs to be developed with behavioural modelling to achieve extended lifetime and high resistance in marine environment;
- c. Deep geothermal drilling: Novel drilling technologies need to be developed to reach cost-effectively depths greater than 5km and temperatures higher than 250°C;
- d. CSP: novel components need to be developed and tested;
- e. Hydropower: novel components for hydropower hydraulic machinery which allow efficient utilization during ramp up and ramp down phases and reduce related machinery wear and tear;
- f. Bioenergy: Improve small and medium-scale combined heat and power (CHP) from biomass to reduce costs of investments through achieving at the same time high resource efficiency and high overall and electrical conversion performance.

Proposals are expected to bring technologies from TRL 3-4 to TRL 4-5 (please see part G of the General Annexes). New components have to be tested in relevant environment.

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

Expected impact: The proposed solution will reduce the CAPEX and/or OPEX of energy generation from any of the mentioned renewable sources making it comparable to overall generation costs from other renewable sources such as PV or on shore wind. With this, the project will contribute to the achievement of the cost reduction targets as stated in the

respective Declaration of Intent of the SET Plan<sup>29</sup>, where applicable, and to the longer term objectives of the Energy Union.

Type of Action: RIA

***LC-SC3-RES-12-2018: Demonstrate highly performant renewable technologies for heat and power generation and their integration in the EU's energy system***

Specific challenge: Progressive replacement of fossil fuels used in the heat and power sectors by means of renewable energy sources can increase energy security, energy price stability as well as independence from imported sources. However, to unlock the full potential of renewable heat and power solutions to significantly contribute to the energy system, improvement of individual technologies performance and their incorporation into the energy system is needed.

Scope: Proposals will address one of the following areas:

- a. *Biomass based combined heat and power (CHP):* Demonstration of technically feasible and cost-effective installation of medium to large-scale CHP through retrofitting of existing fossil-fuel driven CHP or power plants, as such plants are already integrated in the energy grid. Project will address the transformation of existing fossil fuel power plants >10 MW el. to CHP plants with the use of sustainable biomass feedstock. Transformations have to demonstrate their cost benefits over new biomass-based CHP installations and show at least their state-of-the-art requirements for continuous operation and prove advances in combustion emission reduction. Commercial operation of the plant with biomass after the end of the project is to be envisaged.
- b. *Geothermal:* Allowing binary cycle geothermal plants to respond to the heat and to the power demand of the network would increase their cost-effectiveness and facilitate the integration of RES in the energy system. Flexible geothermal units are needed to respond to the demand. In addition, adding to geothermal plants other auxiliary heat sources (i.e. biomass, solar thermal) to geothermal sources is important to increase flexibility and allow for better response to variable heat and power demand. Proposals are expected to propose either more flexible plants or more efficient plants or a combination of these two aspects.

The proposals are expected to bring the technology from TRL 5 to TRL 7 (please see part G of the General Annexes).

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

In order to ensure that a balanced portfolio of activities covering different renewable energy technology areas will be supported, the available budget will be firstly allocated to the highest-ranked proposal in the a) biomass-based CHP and b) geothermal area. In a second round, proposals will be selected for funding regardless of the technology area and only according to the ranking list.

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<sup>29</sup> <https://setis.ec.europa.eu/implementing-integrated-set-plan/no-1-renewables-ongoing-work>

Expected impact: The successful demonstration of the proposed solutions will reduce the cost of combined heat and power generation from renewable sources, making it competitive to alternative fossil fuel base solutions. The proposed solutions are expected to lead to subsequent commercial industrial projects, thus increasing the industrial capacity for renewable power and heat generation at a lower installation cost. This will allow decarbonisation of the heat and cooling sector.

Type of action: IA

***LC-SC3-RES-13-2018: Demonstrate solutions that significantly reduce the cost of renewable power generation***

Specific challenge: The cost of electricity generation from renewable sources has significantly come down in the recent years, often putting PV and onshore wind at parity with fossil fuel generated electricity. However, additional efforts are needed to also bring the costs of electricity generation from other renewable sources to a competitive level, so as to allow their broader penetration in the EU energy mix.

Scope: Proposals will address one of the following issues:

- a. *Offshore wind:* Focus will be on the development and validation of new manufacturing, installation and/or operation techniques. The whole value chain will be involved to avoid over-engineering. Issues for improved production will be identified. All aspects of health and environmental impact issues will be taken into account.
- b. *Deep geothermal:* Depending on the geological conditions, CO<sub>2</sub> and other gases (e.g. H<sub>2</sub>S) emissions can be significant, current technologies for limitation of emission production and/or for gas condensation and re-injection have to be improved to reduce costs. In addition, turning emissions into commercial products would also contribute to cost reduction.

The proposals are expected to bring the technology from TRL 5 to TRL 7 (please see part G of the General Annexes).

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

In order to ensure that a balanced portfolio of activities covering different renewable energy technology areas will be supported, the available budget will be firstly allocated to the highest-ranked proposal in the a) off-shore wind and b) the deep geothermal area. In a second round, proposals will be selected for funding regardless of the technology area and only according to the ranking list.

Expected impact: The successful demonstration of the proposed solutions will pave the way to the achievements of the cost reduction targets for offshore wind and geothermal electricity generation which have been agreed in the Declarations of Intent with the sectorial stakeholders in the context of the SET-Plan<sup>30</sup>.

Type of action: IA

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<sup>30</sup> <https://setis.ec.europa.eu/implementing-integrated-set-plan/no-1-renewables-ongoing-work>

## **Optimize processes and manufacturing**

### ***LC-SC3-RES-14-2019: Optimising processes relevant to manufacturing and system operation***

Specific challenge: Renewable electricity technologies still require optimisation in several key processes of the respective value chains in order to achieve a more efficient conversion of their primary energy source into electricity.

Scope: Proposals will address one of the following issues:

- *Monitoring system for marine energy (ocean and offshore wind):* New intelligent sensors and fault detection systems for accurate condition monitoring will enable predictive and preventive Operation & Maintenance processes. Sufficient knowledge of potential failures and the right tools to detect failures are crucial.
- *Geothermal fluids:* Better understanding of the chemical and physical properties of these fluids, including super-hot and hot fluids, as transport media are necessary to optimize site development and operation.
- *Photovoltaics:* Development of unconventional crystalline silicon wafer growth techniques to produce high-efficiency solar cells and modules.

Proposals are expected to bring the technologies from TRL 3-4 to TRL 4-5 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 to 5 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: The improved performance of processes is expected to lead to an increased power capacity and efficiency of the system and/or to the significant reduction of its operation costs. The proposed solution should contribute in achieving the targets as stated in the respective Declaration of Intent of the SET Plan<sup>31</sup> and contribute to the longer term objectives of the Energy Union.

Type of Action: RIA

### ***LC-SC3-RES-15-2019: Efficient combination of solar thermal electricity and desalination (with particular focus on the Gulf Cooperation Council (GCC) region)***

Specific challenge: Several arid and semi-arid regions of the world are highly dependent on desalination. In several cases these regions have also a solar resource which is suitable for the application of solar thermal electricity (also known as concentrated solar power). Several technical aspects need to be addressed to match in an effective way the thermal process of a solar thermal electricity plant to the energy needs of a desalination system.

Scope: Efficient solutions to couple the thermal cycle of a solar thermal electricity plant with a water desalination system will be demonstrated.

The proposals are expected to bring technologies to TRL 6 (please see part G of the General Annexes) at the end of the project activities.

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<sup>31</sup> <https://setis.ec.europa.eu/implementing-integrated-set-plan/no-1-renewables-ongoing-work>

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

The participation of one or more organizations from one or more of the following countries is particularly encouraged and will be positively evaluated: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates.

Expected impact: Positive impact is expected vis-à-vis the objectives of the various initiatives that are currently addressing the crucial nexus between energy and water systems, in particular the Global Clean Water Desalination Alliance which seeks solutions that reduce the projected increase in CO<sub>2</sub> emissions from desalination process.

Type of Action: IA

### **Increasing the competitiveness of the EU Photovoltaic manufacturing industry**

#### ***LC-SC3- RES-16-2019: Increase the competitiveness of the EU PV manufacturing industry***

Specific challenge: The EU 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, spanning the entire production chain, that substantially improve competitiveness of the EU 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 EU PV market.

Scope: Demonstrating manufacturing as well as product innovation for highly performing PV technologies (e.g. crystalline-silicon, thin-film and concentration PV). Innovative solutions will be demonstrated at pilot-line level, showing the potential to be scaled up to GW-size, high-yield-throughput and cost-effective industrial production of high-efficiency cells and modules. Possible examples range from the optimization of one or more steps in the value chain (by e.g. increased automation, laser processing, etc.) to the tailored development of production equipment, to the increased recyclability of the final product, to the demonstration of production routes for cells and modules based on innovative materials and/or architectures.

Proposals are expected to bring the technology from TRL 5-6 to 6-7 (or higher) (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 10 to 13 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Successful projects are expected to trigger new investments in the EU PV industry, via the establishment of pilot lines which target innovative/optimised production processes and/or tailored development of equipment for mainstream power PV technologies. The proposed solutions are expected to show the potential for cost and performance competitiveness of the final product. The outcome of successful projects will contribute to the achievement of the Strategic Targets of the SET-Plan Declaration of Intent in the context of an Initiative for Global Leadership in PV<sup>32</sup>.

Type of Action: IA

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<sup>32</sup> <https://setis.ec.europa.eu/implementing-integrated-set-plan/no-1-renewables-ongoing-work>

*Special eligibility conditions related to the participation and funding apply to this topic. Please refer to the call conditions.*

### **Provide flexibility to the energy system**

#### ***LC-SC3-RES-17-2020: Improving flexibility to the energy system***

**Specific challenge:** Supporting the balancing of the grid and increasing the energy flexibility is possible through dispatchable renewable energy sources such as bioenergy and hydropower. The specific challenge is to increase the potential and performance of these dispatchable technologies by improving the commodities characteristics of intermediate bioenergy carriers and the technological characteristics of hydropower equipment.

**Scope:** Proposals will address one of the following issues:

- a. *Bioenergy carriers:* Development of intermediate bioenergy carriers for energy and transport from biogenic residues and wastes at a conversion cost reduced by at least 25% from the state-of-the-art, excluding the feedstock cost, and with increased energy density, storage and trade characteristics, where relevant, and improved GHG performance. The state-of-the-art for conversion costs per technology will be clearly presented in the proposal with cost figures and versatility of use where appropriate.
- b. *Hydropower:* to develop low and ultra-low head equipment and sea water resistant equipment (such as for example bulb-pump turbines) guaranteeing at least 70% round-trip efficiency and making low-head seawater storage and other low head applications of hydropower viable, for example at unexplored locations (e.g. like at coastal dams and islands)

Proposals are expected to bring the technologies from TRL 3-4 to TRL 4-5 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 to 5 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

In order to ensure that a balanced portfolio of activities covering different renewable energy technology areas will be supported, the available budget will be firstly allocated to the highest-ranked proposal in the a) bioenergy carriers and b) the hydropower area. In a second round, proposals will be selected for funding regardless of the technology area and only according to the ranking list.

**Expected impact:** The increased flexibility to the energy system will be a result of the proposed solution. The proposed solution will contribute to the longer term objectives of the Energy Union and the 10 actions for research and innovation under the SET Plan<sup>33</sup>. For bioenergy, it will contribute to achieving the specific targets for intermediate bioenergy

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<sup>33</sup> <https://setis.ec.europa.eu/implementing-integrated-set-plan/no-1-renewables-ongoing-work>

carriers agreed in the Declarations of Intent<sup>34</sup> with the sectorial stakeholders in the context of the SET-Plan. For hydropower it will contribute to Mission Innovation Challenge 2<sup>35</sup>.

Type of Action: RIA

***LC-SC3-RES-18-2020: Demonstration of the solutions based on renewable sources that provide flexibility to the energy system***

Specific challenge: Supporting the grid balancing and increasing the energy flexibility is possible by dispatchable renewable energy sources. The specific challenge is to increase the potential of renewable dispatchable technologies in providing flexibility to the energy system. Different technologies are suitable to address this challenge.

Scope: Proposals will address one of the following issues:

- a. *Intermediate bioenergy carriers:* Focus will be on the demonstration of the most cost-efficient intermediate bioenergy carrier pathways for energy and transport, which improve the economic viability of the subsequent energy production by addressing solid, liquid and gaseous intermediate bioenergy carriers from biogenic residues and wastes with increased energy density, storage and trade characteristics where relevant. Reduced conversion costs and improved energy efficiency and GHG performance of the intermediate bioenergy carrier pathway will be demonstrated. Production at a scale of up to 5000 tons and process feasibility through applications to fuel production including for the heavy duty and maritime sectors, as well as to combined heat and power generation, is to be included.
- b. *Hydropower:* Focus will be on the improvement of the average annual overall efficiency of hydroelectric machinery. Projects are expected to provide high availability of hydropower plants and to maximise performance of hydropower plants of all sizes. The aim is adapting to variable speed generation the hydropower plants (new, refurbished and uprated and especially existing ones); it is important that by optimising maintenance intervals for all hydro plants (especially those delivering balancing power because of the related dynamic operation, dynamic loads and increased wear and tear) the outage time will be minimised.
- c. *Thermal storage in Concentrated Solar Power (CSP) plants:* Focus will be on the demonstration of innovative storage systems for CSP plants beyond the current mainstream solutions based on the sensible heat of molten salts. The innovative thermal energy storage solutions proposed (e.g. by means of thermo-chemical reactions) has to achieve much higher storage densities (i.e. at least two times higher than current mainstream solutions).

Proposals are expected to bring the technology from TRL 5 to TRL 7 (please see part G of the General Annexes).

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

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<sup>34</sup> <https://setis.ec.europa.eu/implementing-integrated-set-plan/renewable-fuels-and-bioenergy-ongoing-work>

<sup>35</sup> <http://mission-innovation.net/our-work/innovation-challenges/off-grid-access-challenge/>

In order to ensure that a balanced portfolio of activities covering different renewable energy technology areas will be supported, the available budget will be firstly allocated to the highest-ranked proposal in the a) intermediate bioenergy carriers, b) hydropower and c) thermal storage in CSP plants areas. In a second round, proposals will be selected for funding regardless of the technology area and only according to the ranking list.

Expected impact: The developed technologies will allow plant operators to operate successfully in the modern power markets and to make a significant contribution to European renewable energy objectives and policies. The successful demonstration of the proposed solutions will contribute to achieving the Energy Union targets and for bioenergy carriers and CSP will also pave the way to the specific targets agreed in the Declarations of Intent with the sectorial stakeholders in the context of the SET-Plan<sup>36</sup>.

Type of action: IA

### ***LC-SC3-RES-19-2020: Demonstration of floating wind farms***

Specific challenge: There is still a long way to go to drive down the costs and to create a market for floating wind farms. Many floating concepts have been tested but there is no experience with the operation of a floating wind farm.

Scope: In the demonstration of the floating farm, different array lay-outs will be tested to obtain data for optimal operation of future floating wind farms.

Proposals are expected to bring the technology from TRL 5 to at least TRL 7 (please see part G of the General Annexes).

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

Expected impact: Decrease the cost of floating offshore wind farms and dramatically increase of market potential size and opportunities.

Type of Action: IA

## **4. Renewable Fuels for transport**

The actions address the competitiveness of the next generation of biofuels and renewable fuel technologies as well as the up-scaling of advanced biofuels for specific transport needs in a cost-effective way. Furthermore, they aim at achieving European leadership in global development of specific disruptive technologies for a complete ultimate replacement of fossil fuels.

### **Drop-in renewable fuel solutions for fossil-fuel substitutions**

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<sup>36</sup> <https://setis.ec.europa.eu/actions-towards-implementing-integrated-set-plan>

***LC-SC3-RES-20-2018: Development of next generation biofuels and alternative renewable fuel technologies for road transport***

Specific challenge: Current biofuel and renewable fuel technologies are still not competitive compared to fossil fuel alternatives. This impedes their further development and market penetration. The specific challenge is to increase the competitiveness of next generation biofuel and renewable fuel technologies while diversifying the fuel supply pathways.

Scope: Support will be given to next generation drop-in biofuel and alternative renewable fuel technologies for energy and transport, which improve substantially beyond the state-of-the-art the performance as regards conversion efficiency, cost and feedstock supply, as well as end use compatibility. Proposals have to address one of the following issues:

- liquid diesel- and gasoline-like biofuels from biogenic residues and wastes through either chemical, biochemical and thermochemical pathways, or a combination of them;
- liquid gasoline-like biofuels through biogenic upgrading of biogas.

Proposals are expected to bring the technology from TRL 3 to 5 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 to 5 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: Projects are expected to reduce costs and improve performance of renewable fuels, notably as regards the efficiency, the environment and the society. The proposed solution will contribute to achieving the Energy Union targets and implementing the specific priorities for strengthening the EU leadership on renewables laid out in the Communication for Accelerating Clean Energy Innovation<sup>37</sup>.

Type of Action: RIA

***LC-SC3-RES-21-2018: Demonstration of cost effective advanced biofuel pathways in retrofitted existing industrial installations***

Specific challenge: Commercialization of advanced biofuels depends on up-scaling of the technologies. The specific challenge is to overcome the high cost and high risk of the installation of industrial plants for advanced biofuels.

Scope: Proposals will demonstrate cost-efficient advanced biofuel pathways which improve the economic viability and reduce capital expenditure (CAPEX) and operating expenses (OPEX). This is to be done through retrofitting of existing industrial installations with necessary innovation specific to the proposed advanced biofuel pathway. Proposals will address integration in first generation biofuels sites, in pulp and paper industry or in existing fossil refineries with production of advanced biofuels at a scale of a few thousand tons through upgrading the existing sites with innovative installations. The economic feasibility and other socio-economic benefits including the impact on current first generation sites will be included and clearly demonstrated.

Proposals are expected to bring the technology from TRL 5 to 7 (or higher) (please see part G of the General Annexes).

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<sup>37</sup> COM(2016) 763

The Commission considers that proposals requesting a contribution from the EU of between EUR 8 to 10 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: The supported projects are expected to increase the industrial installed capacity for advanced biofuels. The proposed solution will contribute achieving the Energy Union targets and the specific targets for commercialization of advanced biofuels agreed in the Declarations of Intent with the sectorial stakeholders in the context of the SET-Plan<sup>38</sup>.

Type of Action: IA

### **Upscaling renewable fuels production**

#### ***LC-SC3-RES-22-2019: Development of next generation biofuel and alternative renewable fuel technologies for aviation and shipping***

Specific challenge: Decarbonising the aviation and shipping transport sectors, which are expanding fast and increasing the overall fossil fuel consumption, relies on biofuel and renewable fuels. The specific challenge is to increase the competitiveness of next generation biofuel and renewable fuel technologies in aviation and shipping, compared to fossil fuel alternatives.

Scope: Proposals will develop next generation drop-in biofuel and alternative renewable fuel technologies for aviation and shipping transport, which improve substantially beyond the state-of-the-art the performance regarding conversion efficiency, cost and feedstock supply by addressing:

- liquid jet-like biofuels from biogenic residues and wastes through chemical, biochemical and thermochemical pathways, or a combination of them; and
- bunker fuel-like biofuels for shipping uses.

Proposals are expected to bring the technology from TRL 3 to 5 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 to 5 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: The supported projects are expected to reduce costs and improve performance of renewable fuels for aviation and shipping regarding the efficiency, the environment and society. The proposed solution is expected to contribute to achieving European leadership in this area and to the Energy Union targets, and to implementing the specific priorities for strengthening the EU leadership on renewables laid out in the Communication for Accelerating Clean Energy Innovation<sup>39</sup>.

Type of Action: RIA

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<sup>38</sup> <https://setis.ec.europa.eu/implementing-integrated-set-plan/renewable-fuels-and-bioenergy-ongoing-work>

<sup>39</sup> COM(2016) 763

***LC-SC3-RES-23-2019: International cooperation for Research and Innovation on advanced biofuels***

Specific challenge: The optimisation of biomass supply chains and disruptive conversion technologies are needed for replacing completely the use of fossil fuels in the transport and heating sectors with advanced biofuels and alternative renewable fuels. International collaboration is mutually beneficial in strategic areas where knowledge can be exchanged and Europe can obtain leadership.

Scope: Proposals will address one of the following issues:

- a. Development of novel catalysts with significantly improved performance for conversion efficiency and emission reduction for obtaining low-cost bioenergy carriers, advanced biofuels and alternative renewable fuels. Cooperation with Japan through coordinated basic research activities regarding the development of catalytic disruptive technologies shall be aimed for. A coordinated call leading to coordinated projects financed respectively by the European Commission and the respective authorities of Japan is envisaged.
- b. Development of the full supply chain of biomass-to-bioenergy applications including advanced biofuels, heat and power generation. Biomass production and collection strategies that facilitate sustainable bioenergy production and decrease feedstock supply costs have to be included. All types of biomass, forestry, agricultural and their residues, municipal and industrial wastes can be targeted. Cooperation with Canada through coordinated applied research activities in development of optimized biomass supply chains shall be aimed for. A coordinated call leading to coordinated projects financed respectively by the European Commission and the respective authorities of Canada is envisaged.
- c. Thermochemical processing of biomass to advanced biofuels focusing on the conversion process through coordinated applied research activities with Canada shall be aimed for. A coordinated call leading to coordinated projects financed respectively by the European Commission and the respective authorities of Canada is envisaged.

Grants awarded under this topic will be coordinated and jointly funded with actions run by the respective authorities of Japan (bullet point (a)) and Canada (bullet points (b) and (c)).

The respective options of Article 2, Article 41.5 and Article 50.3.1 (i) (j) 2 of the Model Grant Agreement will be applied.

In order to ensure that a balanced portfolio of different internationally coordinated research activities will be supported, the available budget will be firstly allocated to the highest-ranked proposal for bullet points (a), (b) and (c). In a second round, proposals will be considered for funding regardless only according to the overall ranking list of the topic.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 to 5 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: It is expected that the exchange of knowledge through the coordinated research activities will progress the technology state-of-the-art, strengthen the European technology base and accelerate the development of sustainable fuels to replace the fossil fuel alternatives. The secure, long-term supply of sustainable feedstock will also significantly

contribute to increase the viability of biofuels. The proposed solution will contribute towards the Energy Union targets and the Mission Innovation Challenge 4<sup>40</sup>.

Type of Action: RIA

*Special eligibility conditions related to the coordinated projects apply to this topic. Please refer to the call conditions.*

### ***LC-SC3-RES-24-2019: Boosting pre-commercial production of advanced aviation biofuels***

Specific challenge: The aviation transport sector is growing fast and is expected to be responsible for more than 10% of the global greenhouse gas emissions by 2050. Advanced biofuels achieve direct emission reductions and, as drop-in fuels, are the only alternative for reducing the carbon foot-print of aviation in the long-term. Due to the absence of a market, the specific challenge is to boost commercial availability of advanced biofuels for aviation.

Scope: Proposal will demonstrate pre-commercial production of sustainable and cost-competitive advanced biofuels for aviation for boosting their market up-take. Proposals will address large-scale production of aviation biofuels from sustainable feedstock and through certified pathways according to international aviation fuel standards and thus suitable for commercial flight operations. 30 to 50 thousand tonnes of aviation biofuel and continuous plant operation of 1000 hr within the project will be included.

Proposals are expected to bring the technology from TRL 5 to 7 (or higher) (please see part G of the General Annexes).

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

Expected impact: The supported projects are expected to facilitate the market entry and increase the commercial capacity of advanced biofuels for aviation. In particular, it is expected that pre-commercial plant(s) for advanced biofuels for aviation will be accomplished and the deployment of their technologies will allow the competitive production of biojet fuels on a commercial scale. The proposed solution will contribute to achieving the Energy Union targets and the specific targets for commercialization of advanced biofuels agreed in the Declarations of Intent with the sectorial stakeholders in the context of the SET-Plan<sup>41</sup>.

Type of Action: IA

### **Diversifying feedstock**

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<sup>40</sup> <http://mission-innovation.net/our-work/innovation-challenges/sustainable-biofuels-challenge/>

<sup>41</sup> <https://setis.ec.europa.eu/implementing-integrated-set-plan/renewable-fuels-and-bioenergy-ongoing-work>

***LC-SC3-RES-25-2020: Development of next generation biofuel and alternative renewable fuel technologies from CO<sub>2</sub> and renewable energy (Power and Energy to Fuels)***

Specific challenge: Renewable energy is expected to grow faster than the capacity of the grid expands, thereby creating storage needs. On the other hand, the energy demand for the production of current biofuel and renewable fuels impede their competitiveness as alternatives to fossil fuels. The specific challenge is to increase the competitiveness of next generation biofuel and renewable fuels by utilizing unexploited renewable energy sources for their production.

Scope: Proposal will develop next generation drop-in biofuel and alternative renewable fuels for energy and transport, which improve substantially (beyond the state-of-the-art) the performance regarding conversion efficiency as well as cost and feedstock supply by addressing biofuels and alternative renewable fuels from CO<sub>2</sub> and sunlight or renewable heat.

Proposals are expected to bring the technology from TRL 3 to 5 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 to 5 million would allow this challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

Expected impact: The supported projects are expected to reduce costs of algal fuels, power to gas /liquid and heat to gas/liquid renewable fuels, as well as improving performance of these fuels as regards the efficiency, the environment and society. The proposed solution will contribute to achieving the Energy Union targets and implementing the specific priorities for strengthening the EU leadership on renewables laid out in the Communication for Accelerating Clean Energy Innovation<sup>42</sup>.

Type of Action: RIA

***LC-SC3-RES-26-2020: Demonstration of advanced biofuels production from aquatic biomass***

Specific challenge: The security of feedstock supply is essential for the large-scale production of advanced biofuels which is a prerequisite for improving their competitiveness. The specific challenge is to increase the security of sustainable supply of feedstock at large scale.

Scope: Support will be given to the demonstration of aquatic advanced biofuel pathways which improve the economic viability of the subsequent energy production, including the upgrading technologies and valorisation of co-products. Proposals will address advanced biofuels at a scale of about 1000 thousand tons from macro-algae and fish residues in an energy-driven integrated biorefinery concept demonstrating the achievement of at least 70% energy output (fuel, heat and power).

Proposals are expected to bring the technology from TRL 5 to 7 (please see part G of the General Annexes).

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

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<sup>42</sup> COM(2016) 763

Expected impact: Supported projects are expected to enlarge the feedstock basis and improve technologies for sustainable fuels and energy production. The proposed solution is expected to contribute to achieving the Energy Union and the specific targets for commercialization of advanced biofuels agreed in the Declarations of Intent with the sectorial stakeholders in the context of the SET-Plan<sup>43</sup>.

Type of Action: IA

## **5. Market Uptake Support**

### ***LC-SC3-RES-27-2018-2019-2020: Market Uptake support***

Specific challenge: Since the adoption of RES Directive in 2009, most Member States have experienced significant growth in renewable energy consumption, and the EU and a large majority of Member States are on track towards the 2020 RES targets. The "Clean Energy for all Europeans" package adopted at the end of 2016 introduces further targets towards 2030 and introduces modifications in the energy market design that will empower individuals or communities to participate actively to the energy system transformation. Renewable energy technologies have the opportunity to play an important role in this transition, leading to an increased share of renewable energy consumed in the EU and to a more active role for the consumers. However, introducing and deploying at large scale new technologies entails a number of challenges, notably as regards their initial high cost, the legal and financial barriers arising from bringing novel solutions to a technical environment with already reliable solutions in place, the consumer acceptance.

Scope: The proposal will develop solutions which can be easily implemented for overcoming barriers to the broad deployment of renewable energy solutions. In particular, the proposal will address one or more of the following issues:

- Recommendation for harmonisation of regulations, life cycle assessment approaches, environmental impact and financing best practices of renewable energy power plants;
- Development of additional features for RES to be compliant with the electricity market requirements, making them "market fit", such as developing the possibility to provide additional services to the grid such as peak power, role in electricity balancing/reserve market;
- Support best practice sharing between public funding providers for the cross-border participation in RES electricity support schemes, increasing the recurring of the 3RES co-operation mechanisms" foreseen in the legislation;
- Development of insurance schemes available in Europe and worldwide to mitigate risks, such as in geothermal drilling and offshore installation;
- Development of financing mechanisms and schemes for cost-effective support for uptake of renewable sources, such as through the use of Public Procurement of Innovative Solutions instrument or smartly designed tenders;

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<sup>43</sup> <https://setis.ec.europa.eu/implementing-integrated-set-plan/renewable-fuels-and-bioenergy-ongoing-work>

- Development of support tools to facilitate export markets, e.g. for hydropower. Attention will be made towards capacity building markets in developing countries as well as accompanying applied research packages with the scope to develop and adapt technologies to development country- specific solutions in particular taking into account local aspects of social, economic and environmental sustainability;
- Use of global earth observation data to support development and deployment of renewable energy sources;
- Determining conditions and defining options for retrofitting existing energy and industrial installations (first generation biofuels, pulp and paper, fossil refineries, fossil firing power and Combined Heat and Power (CHP) plants) for the complete or partial integration of bioenergy, with concrete proposals for such retrofitting for the different cases of bioethanol, biodiesel, bio-kerosene, intermediate bioenergy carriers and other advanced biofuels and renewable fuels and biomass based heat and power generation, on the basis of the assessment of the capital expenditure (CAPEX) reduction and market benefit;
- Development of optimisation strategies regarding cost, energy-performance and LCA for bioenergy and sustainable renewable fuels in upgraded energy and industrial installations;
- Development of cost-effective logistics, feedstock mobilisation strategies and trade-centres for intermediate bioenergy carriers.

The complexity of these challenges and 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 will be considered. For all actions, the consortia have to involve and/or engage relevant stakeholders and market actors who are committed to adopting/implementing the results. Where relevant, proposals are expected to 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.

Participation of developing countries is encouraged, in particular if these countries have identified energy as a priority area for their development and whenever common interest and mutual benefits are clearly identified.

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 that the solution proposed will contribute to:

- facilitate the introduction of these technologies and increase the share of renewable energy in the final energy consumption;
- Lead to substantial and measurable reductions in the transaction costs for project developers as well as for the permitting authorities, whilst still fully addressing the needs for environmental impact assessments and public engagement, including considerations for indirect impacts and energy balance;
- Develop more informed policy, market support and financial frameworks, notably at national, regional and local level.

Type of Action: CSA

### **3. Smart and clean energy for consumers**

Consumers should be considered as active market players in the energy system. The future consumer should be better informed and more aware, and have an increased capacity to fully engage in energy markets.

#### ***LC-SC3-EC-1-2018-2019-2020: Motivating consumers towards active demand services***

Specific challenge: Barriers continue to exist to the integration of consumers into the energy market, and to consumers fully benefitting from active demand side services available on the market. These include the issue of split incentives between tenants and owners, as well as financial and legal barriers such as contractual conditions (e.g. with suppliers, utilities) and regulatory conditions related to the provision of active demand side services. A precondition for active demand is also that consumers are aware of their own potential to permanently or temporarily reduce energy consumption; moreover that they know how to offer this potential to the market and what it would represent in terms of monetary value by bringing benefits to the energy system.

Different forms of collective action have the potential to assist consumers in forming critical mass and to facilitate increased uptake of energy efficiency & smart energy solutions. Although collective actions on energy efficiency have emerged in recent years, a lack of awareness on the potential benefits of such actions, together with regulatory barriers, continues to hamper their full development and uptake.

More information is needed on the motivations and drivers of consumer behaviour in relation to adopting and accepting active demand side services, with a view to better informing the design of the energy transition and facilitating removal of existing barriers. Important challenges involve installed appliances (like boilers for space and/or water heating) of which a big share is inefficient, resulting in increased energy consumption and costs for households. Informing consumers on the potential energy savings and their monetization can result in their increased motivation for replacing inefficient appliances in this way permanently reducing the consumption.

Scope: Develop and implement effective actions to inform, assist, and engage consumers to better understand, and benefit from energy efficiency measures and active demand side services, thereby reducing energy consumption in their homes, the heating/cooling systems, and/or appliances. The proposed actions should address the risk of "rebound effects", propose measures to counteract them, and apply current theory and practice on consumer decision-making processes. All relevant stakeholders necessary for the successful implementation of the action should be involved and relevant consumer organisations, in particular, should be either directly involved or their support demonstrated in the proposal. Finally, the proposed actions should gather and analyse data, stemming from the actions, on the drivers of consumer acceptance and behaviour change in relation to uptake of energy efficiency measures and active demand side services.

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

- Inform and facilitate consumer adoption of active demand side services (energy efficiency, generation, storage and flexibility);

- Support different forms of collective action for energy efficiency and active demand side services;
- Identify and implement solutions to address split incentives (e.g. allowing tenants to benefit from active demand side services);
- Identify and address regulatory barriers and contractual conditions with utilities, suppliers, etc., including linking activities with structural solutions involving public authorities;
- Inform and motivate consumers to change old and inefficient installed appliances (e.g. boilers, local space heaters, air heaters).

Projects are expected to involve at least 5 000 consumers per million Euro of EU funding.

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, where applicable, using quantified indicators and targets wherever possible:

- Primary energy savings triggered by the project (in GWh/year per million Euro of EU funding);
- Investments in sustainable energy triggered by the project (million Euro of investments per million Euro of EU funding);
- Contribution to reducing regulatory barriers and improving contractual conditions.

Type of action: CSA

### ***LC-SC3-EC-2-2018-2019-2020: Mitigating household energy poverty***

Specific challenge: European households continue to spend an increasing share of income on energy, leading to higher rates of energy poverty and negatively affecting living conditions and health. Recent estimates suggest that more than 50 million Europeans are affected by energy poverty understood as non-affordability to pay for energy. Although roots of this phenomenon lie mainly in low incomes and poor thermal efficiency of buildings, energy efficiency measures at the household level and increased use of renewable energy are key tools in addressing energy poverty and can bring energy savings, leading to lower running costs and improved living conditions.

In this context, the role of local and national authorities, related networks and initiatives, and availability of support schemes are important to ensure the sustainability and larger scale uptake of the measures.

Energy Efficiency Obligation Schemes<sup>44</sup> can also be used to promote social aims, such as tackling energy poverty. The obliged parties (utilities) have potentially at their disposal the necessary data and means to identify energy poverty among their clients and effectively

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<sup>44</sup> Stemming from art 7 of the Energy Efficiency Directive

address it by fulfilling in this way the energy efficiency obligation. Building capacity of the obliged parties is needed in order to spread such schemes across the EU.

Scope:

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

- Facilitate behaviour change and implementation of low-cost energy efficiency measures tailored for energy poor households in energy poor households (e.g. provision of information and advice, energy efficiency services such as draught proofing or optimisation of existing building technology systems, as well as energy efficiency devices & kits such as low-energy lighting);
- Support the set-up of financial and non-financial support schemes for energy efficiency and/or small scale renewable energy investments for energy poor households. These actions should be embedded in, and add value to, structural frameworks and activities involving local, regional, and national authorities, and/or networks such as the Covenant of Mayor;
- Develop, test and disseminate innovative schemes for energy efficiency/RES investments established by utilities or other obliged parties under Article 7.

Projects should involve at least 5 000 consumers per million EUR of EU funding.

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, where applicable, using quantified indicators and targets wherever possible:

- Primary energy savings triggered by the project (in GWh/year per million Euro of EU funding);
- Investments in sustainable energy triggered by the project (million Euro of investments per million Euro of EU funding);
- Contributions to policy development and to best practice development on energy poverty;
- Support schemes established for energy efficiency and/or small-scale renewable energy investments and to be sustained beyond the period of EU-support.

Type of action: CSA

***LC-SC3-EC-3-2018-2019-2020: Consumer engagement and demand response***

Specific Challenge: To put consumers / prosumers at the heart of the energy market and to develop and demonstrate solutions to establish a fair deal for consumers while providing services to the grid.

In the absence of any demand response mechanism, electricity consumers impose on the system their consumption profiles which are based on their activity (e.g. peaks of consumption at the beginning and the end of the day in households) or external conditions such as the outside temperature in the case of electricity-based heating or cooling.

Variable renewables such as wind and solar are expected to bring a major contribution to the decarbonisation of our electricity system with an expected overall share of renewables of 50% by 2030 (today 30%) which will increase strongly the variability of production. Satisfying a 'rigid' demand under these conditions will become increasingly challenging and would call for strong investments in terms of network infrastructure and variable generation assets.

Therefore, engaging consumer and prosumers in demand-response mechanisms with variable prices reflecting the scarcity of electricity production has the potential to lower such costs and to allow consumers to benefit from price fluctuations. This will be a central element in the future market design for the European electricity grid.

Scope: Proposals should develop and demonstrate solutions for demand response for different types of consumers (residential, industrial, commercial and tertiary, including prosumers who are self-consuming part of the energy they produce). Proposals can also target one or multiple types of loads (e.g. industrial loads, appliances, electric vehicles, power to heat / cool, etc.) and one or several methods of aggregation (e.g. local energy communities) preferably relying on advanced automation, advanced ICT tools and approaches (e.g. IoT, Big Data) and communication protocols. Appropriate links and communication with grid operators should be ensured so as to optimise and facilitate the use of the provided services.

A fair share of the benefits of variable prices should be agreed to remunerate the services provided and to create sufficient incentives for consumers to engage.

Customer information and engagement strategies should be designed, tested and analysed a posteriori with the view of drawing conclusions from the different types of consumers (e.g. social category, age, technology literacy, gender), on the considered geographical location and climatic conditions and on the type and magnitude of incentives, putting the citizen at the centre of the proposed approach.

The participation of local communities, energy cooperatives and local actors is encouraged. The direct or indirect participation of Consumer associations is an added value. EU wide geographical diversity is a further asset.

The study of the behaviour of the different stakeholders based on Social sciences and humanities should be part of the proposal.

As regards data handling and data protection, proposers are invited to refer to the provisions in the introduction. Existing regulatory barriers should be analysed under the current context but also under the future market design context.

Proposals are requested to include the coordination of the relevant project findings with the BRIDGE initiative<sup>45</sup>.

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 supported projects are expected to:

- Develop and demonstrate viable solutions for customers: best practices and effective incentives that can be replicated at large scale;

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<sup>45</sup> <http://www.h2020-bridge.eu/>

- Demonstrate robust solutions for privacy and data protection;
- Develop new services for grid operators;
- Increase the share of energy that can be mobilised via demand response to provide services to the grid.

Type of Action: IA

#### **4. Smart citizen-centred energy system**

The EU's energy policy package "Clean Energy for all Europeans" (adopted by the Commission on 30 November 2016) puts the citizen in the centre of the EU's energy system. Actions are needed to support the best implementation of this ambitious package of legislation. Therefore this section of the Work Programme on Integrated Energy Systems aims, among others, at preparing and testing solutions to support the new proposals for directives and regulations which are shaping the energy system of the future. In addition, the energy transition proposed in "Clean Energy for all European" insists on the importance to decarbonise heating and cooling, electricity and transport.

Therefore two main lines of actions are proposed:

- Electricity markets and consumers, interacting with other energy vectors;
- Decarbonisation of local energy systems whether on islands or on the continent.

Common requirements regarding proposals relevant to "Electricity markets and consumers, interacting with other energy vectors".

Since the associated directives and regulations will be negotiated with the Parliament and the Council in the coming years, it is important to ensure coherence and organise a feedback from the R&I projects towards policy makers. We will therefore pursue the BRIDGE initiative<sup>46</sup> which integrates and structures feedback of projects along, for the time being, four lines:

- (1) Business models
- (2) Customer engagement
- (3) Data management
- (4) Regulation

Ongoing projects of the 2014, 2015 and 2016 calls have delivered first results and the relevant Innovation Actions from the 2018 to 2020 will also be asked to contribute. Relevant regulatory issues should be analysed also in the context of the future electricity market design.

Proposals have to 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. follow-up activities to the CEN-CLC-ETSI M/490), regulatory environment for privacy, data protection, data management and alignment of data formats (e.g. the work of the ad-hoc group on "My Energy Data" and its respective follow-up), cyber security, smart grid deployment, infrastructure and industrial policy

<sup>46</sup> <http://www.h2020-bridge.eu/>

(<http://ec.europa.eu/energy/en/topics/markets-and-consumers/smart-grids-and-meters/smart-grids-task-force>).

Project dealing with data handling and management should comply with the provisions of the General Data Protection Regulation<sup>47</sup> and industry standards, especially the Data Protection Impact Assessment Template<sup>48</sup>. A high level of cyber security must be guaranteed in compliance with relevant EU security legislation<sup>49</sup> and with due regard of best available techniques for ensuring the highest level of protection<sup>50</sup>.

Proposals with a high digitalisation content should demonstrate, where relevant, that they rely on the most recent approaches developed in the field at EU level (Internet of Things, Big Data, 5G, etc.).

### Mission Statement

The Topics in this area should contribute to test a certain number of approaches proposed in the legislative package 'Clean Energy for All European' and develop technologies and solutions which will enable these approaches to be implemented under economic conditions.

Overall, the Topics proposed should also contribute to the 2030 Climate-Energy objectives (40% GHG reduction with respect to 1990, at least 27% of renewables by 2030).

A first group of topics (ES-1, ES-2 and ES-5) is expected to increase the capacity of the European electricity grid to host a larger share of variable renewables so as to accelerate its decarbonisation. For this purpose, stronger engagement of consumers is needed, more flexibility services for both the distribution and the transmission grids, higher levels of regional cooperation (i.e. cooperation between a group of neighbouring countries) at transmission levels and well-functioning retail and wholesale markets that are capable of financing necessary investments.

A second group of topics (ES-3 and ES-4) is expected to impact on the decarbonisation of energy systems on geographical islands and at local levels on the mainland taking advantage of the availability of local renewables resources, the specificity of the demand and of the local energy networks to design and demonstrate low carbon local energy system.

### Potential Updates

Based on ongoing ERA-NETs in this field and ERA-NET under evaluation, it is anticipated that new topic(s) for ERA-NET will be introduced during the period 2018-2020, but it is too early to define such topic(s) already at the time this call is initially published.

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<sup>47</sup> Regulation (EU) 2016/679

<sup>48</sup> Supported by the Commission Recommendation 2014/724/EU

<sup>49</sup> Directive (EU) 2016/1148

<sup>50</sup> Best Available Techniques for data protection and security regarding the ten minimum functional requirements for smart metering which were proposed in the Commission Recommendation 2012/148/EU.

### ***LC-SC3-ES-1-2019-2020: Flexibility and retail market options for the distribution grid***

Specific Challenge: Today, up to 90% of variable generation electricity sources are connected to distribution grids that were originally designed to distribute electricity provided by large centralised power generation plants through the transmission grid. In view of the expected growth of variable electricity production, and a shift towards more electrified heating, cooling and transport sectors, new approaches have to be found for managing electricity distribution grids in order to ensure affordability of energy, security and stability of supply, while avoiding massive investments in infrastructures. Electricity storage, power to heat and other storage solutions will play a key role.

Scope: Proposals should develop and demonstrate integrated solutions which will allow the distribution grid to function in a secure and stable manner with large shares of variable renewables, while allowing these to provide services to the grid. A combination of at least two of the following elements should be tested:

- Flexibility measures and electricity grid services provided by storage of electricity, heat, etc., demand response (proposers who want to address specifically demand-response should consider topic LC-SC3-EC-3-2018-2019-2020) and variable generation enabling additional decarbonisation;
- Smart grids technologies for an optimum observability and tools for automation and control of the grid;
- Market mechanisms, in particular flexibility markets or other market tools should be defined and tested, for mitigating short-term and long-term congestions or other problems in the network (e.g. variable tariffs and solutions to reduce the costs of energy transition, non-frequency ancillary services). Solutions should demonstrate the necessary cooperation with other system operators and particularly TSOs.

Approaches to data handling and management should follow common principles stated in the introduction to this area.

The Commission considers that proposals requesting a contribution from the EU of between EUR 6 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 supported projects are expected to develop and demonstrate solutions which:

- Bring the necessary flexibility to a distribution grid which is expected to operate with 50% renewables in 2030;
- Test the conditions for a well-functioning retail market which creates business case for stakeholders willing to provide such flexibility and allow to sustain the necessary investments (e.g. variable price strategies);
- Are capable of managing future energy loads and particularly electrical vehicles;
- Optimise operations of the distribution network which guarantee security of supply while integrated large share of variable renewables;
- Replicability and scalability of solutions is desirable to ensure the maximum impact of the use of the project results.

#### Type of Action: IA

### ***LC-SC3-ES-2-2018-2020: Solutions for increased regional cross-border cooperation in the transmission grid***

Specific Challenge: Today wholesale prices are still varying significantly across the different market zones in Europe showing that the wholesale market is not operating under optimal conditions while some interconnectors are underutilised. More cooperation between TSOs, in particular at regional level (i.e. involving a group of countries), is an element that is promoted in the future market design to contribute to improving this situation.

Scope: Proposal should demonstrate integrated solutions for the transmission grid and the wholesale market which integrate flexibility options, in particular in a regional context.

Proposals should integrate at least four of the following points:

- Tools for communication and grid operation involving several TSOs in the context of regional cooperation;
- Better prediction of production from variable renewables and demand response forecast at regional level;
- Definition and testing of new grid services called by an increasing share of renewables (flexibility, balancing, decrease of system inertia, congestion, etc.);
- Mechanisms to ensure a well-functioning wholesale market;
- Enhance cross border flow and trading;
- Demonstration in a regional context. Priority given to regions where this cross-border cooperation does not occur. The demonstration should be supported by the experience of more advanced regions (intra-EU and inter-EU); when dealing with EU-border countries, special attention should be paid to reduce external energy dependence through more efficient cooperation.

As regards data handling, big data, security and data protection, please note the provision in the introduction to the energy system topic group.

The Commission considers that proposals requesting a contribution from the EU of between EUR 8 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 supported projects are expected to contribute to:

- Develop and demonstrate solutions to bring more regional cooperation to the transmission grid, and to enable a well-functioning wholesale market in the context of an increasing share of variable renewables;
- Enhanced regional cooperation allowing optimum infrastructure investments;
- Development of common approaches to grid services;
- Well-functioning wholesale market.

#### Type of Action: IA

### ***LC-SC3-ES-3-2019-2020: Integrated local energy systems (Energy islands)***

Specific Challenge: The fast growth of the energy production from photovoltaic and wind offers new and economically attractive opportunities for decarbonising local energy systems on the mainland. At the same time, it is also a technological challenge for the electricity network. In addition to wind and photovoltaics, other local energy sources may also be

available, e.g. biomass, waste, waste heat, water, etc. Decarbonisation and energy savings should result from an optimal combination of these energy sources. In this context, storage of all energy vectors and intensive use of the latest digitisation technologies will certainly play an increasingly important role. Energy islands may also show economically interesting conditions to boost local energy sources. Innovative approaches can result in attractive business cases also for remote areas. At the same time, decarbonisation has to go hand-in-hand with the improvement of local air quality.

Scope: Proposals should develop and demonstrate solutions which analyse and combine, in a well delimited system, all the energy vectors that are present and interconnect them where appropriate.

Proposals should present a preliminary analysis of the local case and propose to develop solutions and tools for the optimisation of the local energy network, but having a high replication potential across Europe.

Local consumer should be heavily involved in the projects from the start. Solutions should be demonstrated.

The Commission considers that proposals requesting a contribution from the EU of between EUR 5 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 supported projects are expected to:

- Demonstrate an ambitious decarbonisation of the local energy system while ensuring a positive impact on the centralised energy infrastructure, on the local economy and local social aspects;
- Involve/ create energy communities in the development and the operation of local energy systems and create new business models since the start of the project;
- Develop safe and secure local energy system that integrates significant shares of renewables (electricity, heating, cooling, water, wastes, etc.). For variable renewables, this entails the development of an accurate prediction system for the local generation of energy as a function of time;
- Develop models that can be replicated in many local regions.

Type of Action: IA

#### ***LC-SC3-ES-4-2018-2019-2020: Decarbonising energy systems of geographical Islands***

Specific Challenge: Energy prices on geographical island are typically 100% to 400% higher than on the mainland; therefore the large scale deployment of local renewable energy sources brings economic benefits and, at the same time, contributes to decarbonise the energy system of the island.

Scope:

The proposed solutions should contribute to at least 4 of the following issues:

- Achieve very high levels of local renewable energy sources penetration;

- Achieve highly integrated and digitalised smart grids based on high flexibility services from distributed generation, demand response and storage of electricity, heat, water, etc.;
- Develop synergies between the different energy networks (electricity, heating, cooling, water, transport, etc.);
- Achieve a very significant reduction of the use of hydrocarbon based energies (ideally achieve carbon neutral primary energy for all non-transport uses).Modelling, forecasting of demand (e.g. for touristic/non-touristic seasons) and supply (e.g. based on weather, wind, sun, etc.);
- Innovative approaches to energy storage (including avoidance or delay of costly grid upgrades of existing grids).

Proposals should include:

- one single demonstration on one island;
- at least 3 other follower islands with similar problems; these follower islands will develop plans to adapt similar solutions to their island in a cost-efficient way.

Proposals are expected to include the following aspects:

1. locally applied innovative business models;
2. citizens and other consumers acceptance and behaviour, and other social sciences and humanities research;
3. data management and data security;
4. barriers of local regulation and legislation, incl. local DSOs and authority acceptance.

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 projects are expected to:

- demonstrate RES-based systems (including heating and cooling and storage) that are cheaper than diesel generation;
- demonstrate significant reduction of diesel consumption;
- demonstrate the energy transition ready for large-scale replication on the same island and on other islands with similar problems;
- demonstrate more autonomy for islands that are grid connected with the mainland (existing diesel generators shall be used primarily as security back-up in the long term).

Type of Action: IA

***LC-SC3-ES-5-2018-2020 TSO – DSO – Consumer: Large-scale demonstrations of innovative grid services***

Specific Challenge: The legislative proposals on the energy market that the Commission adopted on 30 November 2016 (the so-called winter package), in particular the Electricity

Directive, promotes that network operators procure balancing, congestion management and ancillary services from assets connected to the network both at transmission and at distribution level, based on cooperation among them.<sup>51</sup> This will enable more efficient and effective network management and optimisation, for the benefit of increased demand response and the ability to integrate increasing shares of renewables. TSOs and DSOs will use the same pool of resources: actions by both can mutually affect each other. In cooperation with market participants, they have to define the services they want to procure, and have to set up ways to procure them in a coordinated manner.

Scope: The focus is on projects that demonstrate at a large-scale how markets and platforms enable electricity TSOs and DSOs to procure energy services from large-scale and small-scale assets connected to the electricity network<sup>52</sup>, through a combination of local markets with wholesale & balancing markets, in a way that will increase cost-efficiency in (future) network operations and that creates consumer benefits. The markets and platforms should enable the integration of relevant digital technologies like Internet-of-Things, Artificial Intelligence, cloud and big data services. The projects selected will define and test in real-life demonstrations of integrated system-based markets and platforms for (a set of) grid services that can be used and procured by DSOs and TSOs in a coordinated manner, in markets that they jointly set up (but don't necessarily need to operate themselves), in a way that:

- enables TSOs and DSOs to give incentives to connected consumers/devices to improve predictability and anticipate problems;
- defines and tests 1) standardised products and key parameters<sup>53</sup> for grid services; 2) the activation process for the use of assets for network services; 3) the settlement process for payment related to the services;
- facilitates scaling up the platforms and markets to spread its wider use and to increase liquidity, in particular by facilitating aggregation of small-scale assets;
- is compatible across borders and in line with EU rules on market coupling and balancing;
- allows procurement based on the specific location (if necessary);
- integrates new services into existing platforms and/or links new services to existing markets as much as possible.

Selected projects also will:

- Define the needs of network operators for system operation, and turn these into services and products, based on interaction with suppliers, aggregators and energy service companies, that test what services can be provided by what assets;
- Test the needs of network operators and technological capabilities of the assets (e.g. duration, ramp-up/ramp-down);

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<sup>51</sup> see a.o. the proposed Guideline on Electricity Balancing, Article 32 of the proposal for a Directive on the internal electricity market, COM(2016)864, 2016/0380(COD), Article 53 of the proposal for a Regulation on the internal electricity market, COM(2016)861, 2016/0379(COD)

<sup>52</sup> not owned by the TSO or DSO but for example by consumers, e.g. domestic hot water boilers, freezers, batteries in/from electric cars or stationary, PV panels, or by operators of other networks, such as district heating

<sup>53</sup> where such parameters don't exist yet at EU level

- Identify the relevant grid data that enable market participants to better assess and forecast the need for grid services and publish such data (as much as possible);
- Test innovative ways to promote consumer participation, engagement and perception, such as peer-to-peer trading, and innovative ways to reduce transaction costs, such as via distributed ledgers (blockchain);
- investigate the possibilities for innovative pricing and compensation (including through local markets) for consumers that provide the grid services, taking into account tariff and tax systems;

In relation to the organisation, selected projects have to:

- Involve at least 4 companies that provide energy (services)<sup>54</sup>, at least 3 Transmission System Operators (TSO) from 3 different Member States, as well as at least 9 Distribution System Operators (DSO) from 3 different Member States, with at least 3 DSOs directly connected to the transmission system of one of the 3 participating TSOs;
- Coordinate their work with NRA's, ENTSOe, the DSO organisations and other stakeholders and with other projects through the Bridge initiative<sup>55</sup> and work with the Digitisation of Energy Projects;
- Make use of cascading funds: for the incorporation of developers of additional services (in particular for consumers), the projects may involve financial support to third parties in line with the conditions set out in Part K of the General Annexes. Each consortium will define the selection process of the third parties for which financial support will be granted (typically in the order of EUR 75.000-150.000 per party<sup>56</sup>). Up to 10% of the EU funding requested by the proposal may be allocated to the purpose of financial support to third parties.

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

Up to one project will be supported under this topic per year (1 project in 2018 and one project in 2020).

#### Expected Impact:

- Set up and demonstrate at large scale (one or more) markets for electricity network services, that integrate ancillary services, congestion management and balancing;
- Proof of concept that can be applied by other TSOs and DSOs;
- Input for network codes, in particular on demand response.

#### Type of Action: IA

<sup>54</sup> E.g. suppliers, ESCO's, aggregators, cooperatives;

<sup>55</sup> <http://www.h2020-bridge.eu/>

<sup>56</sup> In line with Article 23 (7) of the Rules for Participation the amounts referred to in Article 137 of the Financial Regulation may be exceeded, and if this is the case proposals should explain why this is necessary to achieve the objectives of the action.

### ***LC-SC3-ES-6-2019-2020: Research on advanced tools and technological development***

Specific Challenge: A number of tools and future technologies need to be developed, matured and tested to cover gaps and/or to prepare the energy system of 2030 and beyond.

#### Scope:

Proposals should address one of the following issues:

##### 1) Advanced tools for:

- the modelling of the future electricity market to study and analyse the impact of scarcity prices from the wholesale markets to the retail markets, design of electricity pricing structure;
- the optimisation of the use of existing electricity assets and network capacity;
- the design and planning of electricity grid infrastructure including distribution and transmission level, taking into account environmental concerns and footprints and the new constraints from variable renewable generation and the place and role of storage;
- modelling and forecasting energy production from variable renewables, associated frequency and voltage controls issues in the electricity grid;
- communication tools and definition of new services needed by the electricity grid (TSO, DSO, providers of services such as flexibility, balancing, congestion, etc.) – in close relation with relevant demo projects and the BRIDGE initiative<sup>57</sup>; involvement of regulators will be an added value
- Risk preparedness (winter package)

##### 2) Advanced technologies for:

- Advanced storage management technologies, reducing the cost of mature storage technologies;
- Power electronics for batteries and software to manage combined or hybridised decentralised energy systems, also combining several energy vectors: a key focus is on significant cost reduction of these key components for homes, districts and larger systems which have the potential to accelerate significantly the energy transition of the electricity network.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 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:

- 1) These tools are expected to increase the reliability of the future electricity market, and develop new approaches to electricity grid planning and monitoring and contribute to savings of infrastructure costs.
- 2) The new key technologies are expected to reduce costs of key technology components to allow European Industry to keep and extend its leadership in power electronics for

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<sup>57</sup> <http://www.h2020-bridge.eu/>

stationary battery systems of all sizes (from home to utility scale) and the integration of battery systems with high shares of renewable electricity and eventually also heating and cooling.

Type of Action: RIA

***LC-SC3-ES-7-2019: Pan-European Forum for R&I on Smart Grids, Flexibility and Local Energy Networks***

Specific Challenge: According to the JRC Smart Grid Projects Outlook 2014<sup>58</sup>, the majority of cooperation takes place between organisations from a limited number of Member States while 15 analysed countries (NO, CH, IE, PL, HU, SK, LT, RO, LV, HR, BG, LU, CY, EE, MT) account for less than 5 % of the R&I funds altogether.

Scope: The action should set-up a European Forum composed of R&I policy makers, actors and experts ('community') in the field of smart grids / storage and local energy systems that is representative of the EU-28 energy system. The goal is to evolve towards a truly integrated pan-European R&I community with a high level of synergies, spread and representativity over a recommended duration of 4 years.

Actions should be proposed to establish and spread the state of the R&I in the field in Europe. A number of regional workshops where exchanges of experience and capacities between members of R&I community that are not used to collaborate will be organised where the key R&I challenges will be identified, discussed and structured. Advantage should be taken of other events and conferences, preferably well-known and occurring on a regular basis, to organise such workshops.

Beyond workshops, a methodology should be put in place that will allow developing the elements stated in the paragraph above on a long term perspective relying on diversified but combined means (virtual meeting, use of social media, setting up discussion groups, establishing collaborative working spaces). These new links, new knowledge and potential future collaboration should materialise through the delivery of reports (e.g. at regional and EU level).

The European Technology and Innovation Platform Smart Networks for Energy Transition (ETIP SNET), ongoing Horizon 2020 projects (e.g. the BRIDGE project<sup>59</sup>) in the field, and existing associations with a true pan-European dimension will have an important role to play. This action should also contribute to widen the representativity of European associations in the field which have weaknesses in their EU coverage.

The consortium should be composed of a limited number of relevant beneficiaries offering the possibility to invite ad-hoc R&I policy makers, actors and experts when needed. The consortium should achieve a well-balanced geographical representation at EU level.

The Commission considers that proposals requesting a contribution from the EU of between EUR 2 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.

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<sup>58</sup> [http://ses.jrc.ec.europa.eu/sites/ses.jrc.ec.europa.eu/files/u24/2014/report/ld-na-26609-en-n\\_smart\\_grid\\_projects\\_outlook\\_2014\\_-\\_online.pdf](http://ses.jrc.ec.europa.eu/sites/ses.jrc.ec.europa.eu/files/u24/2014/report/ld-na-26609-en-n_smart_grid_projects_outlook_2014_-_online.pdf)

<sup>59</sup> <http://horizon2020-story.eu/contact/>

Up to one project will be supported under this topic.

Expected impact:

The supported project is expected to contribute to:

- Building a true pan-European R&I community in the field of smart grids & associated flexibility measures / energy systems;
- Establish new collaboration on a long-term perspective which has a potential to develop into industrial collaborations;
- Building, in the long-term, solidarity and trust for a well-functioning and resilient pan-European energy system (e.g. contributing to risk preparedness).

Type of Action: CSA

## **5. Smart Cities and Communities**

### ***LC-SC3-SCC-1-2018-2019-2020: Smart Cities***

Specific Challenge: Many cities have set themselves climate goals whose achievement rests on demonstrating highly integrated and highly efficient energy systems.

For achieving the energy transition in cities, it is necessary to push energy performance levels significantly beyond the levels currently requested in the latest building codes and deliver energy-plus districts by 2050<sup>60</sup>. The challenge is to develop Positive Energy Blocks/Districts<sup>61</sup> from a technical, financial, social, regulatory and legal point of view.

Scope:

Proposals should pay particular attention to:

- its ability of being replicated;
- the important role of energy communities to ensure durability and sustainability of energy-plus districts.;

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<sup>60</sup> See also: [Communication on Accelerating Clean Energy Innovation - http://ec.europa.eu/energy/sites/ener/files/documents/1\\_en\\_act\\_part1\\_v6\\_0.pdf](http://ec.europa.eu/energy/sites/ener/files/documents/1_en_act_part1_v6_0.pdf)

<sup>61</sup> Positive Energy Blocks/Districts consist of several buildings (new, retro-fitted or a combination of both) that actively manage the energy flow between them and the larger energy system. They make optimal use of advanced materials, local RES, local storage, smart energy grids, energy, demand-response, electrical vehicles and their charging systems, cutting edge energy management (electricity, heating and cooling), user interaction/involvement and ICT. Positive Energy Blocks/Districts have a better than net-zero-energy balance (excluding grey energy<sup>61</sup>) throughout their entire lifetime. In short, they produce more energy from renewable sources than they consume whilst achieving desirable comfort levels. They are designed as an integral part of the district/city energy system and have a positive impact on it. Their concept is intrinsically scalable and they are well embedded in the spatial, economic, technical, environmental and social context.

- active involvement of citizens, increased energy awareness, pro-active energy management, crowdsourcing (intellectual or economic) etc.;
- create a "smart energy ownership" positive feedback loop;
- not compromising air quality for decarbonisation.

Projects are expected to cooperate with other projects in the area of Smart Cities and Communities funded under Horizon 2020<sup>62</sup> or supported in the context of the European Innovation Partnership on Smart Cities and Communities (EIP-SCC)<sup>63</sup> on issues including:

- business models;
- regulatory and legal aspects;
- citizen's acceptance (Social Sciences and Humanities);
- big data, data management and digitalisation;
- monitoring and data feeding to the existing Smart Cities information system.

Proposals have to foresee inter-project cooperation and earmark appropriate resources (5% of the requested EU contribution) leaving enough contingencies for common actions that become necessary to increase impact during the project.

Highest priority is on impact: The higher the relative improvements, the better, i.e. proposals are also welcome from cities that are not (yet) technological avant-garde, but that propose high impact improvements.

Consortia shall be composed of at least 2 lighthouse cities and 5 follower cities.

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

Typically, projects should have a duration of 48 to 60 months.

All lighthouse cities must have a validated Sustainable Energy Action Plans (SEAP)<sup>64</sup> or a similar, but more ambitious national plan.

#### Expected Impact:

Supported projects are expected to contribute to:

- Significantly increased energy efficiency on district scale;
- Significantly increased share of renewable energies, their integration into the energy system, stimulate self-consumption, reduced curtailment;
- Roll out of Positive Energy Blocks of interlinked buildings (PEB) that are leading the way towards energy-plus districts;

<sup>62</sup> <http://ec.europa.eu/inea/en/horizon-2020/h2020-energy/projects-by-field/smart-cities-and-communities>

<sup>63</sup> <http://ec.europa.eu/eip/smartcities/>

<sup>64</sup> [http://www.covenantofmayors.eu/actions/sustainable-energy-action-plans\\_en.html](http://www.covenantofmayors.eu/actions/sustainable-energy-action-plans_en.html)

- Ready-to-use district planning approaches that are proven in performance, actively made accessible for others to take up and run with, where local conditions permit;
- Deep citizen involvement that will contribute to the success of the project.

Type of action: IA

## **6. Enabling near-zero CO<sub>2</sub> emissions from fossil fuel power plants and carbon intensive industries**

CCS is one of the key promising technologies that can reduce CO<sub>2</sub> emissions in the power generation sector and the only pathway for very stringent GHG emission reductions from energy and/or carbon intensive industries that generate CO<sub>2</sub> as part of their production processes.

In order to realise its potential, CCS needs to become a cost-competitive technology and gain public acceptance (mainly regarding storage safety), so that it could start to be commercially deployed and thus contribute to the low-carbon transition of the European economy. Key challenges are the reduction of the energy penalty and cost of capture, the detailed appraisal of cost-effective storage capacity in selected regions, and establishing the necessary infrastructure for CO<sub>2</sub> transport, with the ultimate goal of demonstrating the full CCS chain at industrial scale.

New solutions for the conversion of captured CO<sub>2</sub> (CCU) to useful products such as fuels or chemicals will create new markets for innovative industrial sectors and can play a role in supporting the deployment of CCS by offsetting the high costs of capture and storage.

The integration of flexible fossil fuel power generation and storage (including through power-to-X) will contribute to a smart, secure and more resilient power system.

### ***LC-SC3-NZE-1-2018: Advanced capture technologies***

Specific challenge: Commercial 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. A continuous effort is needed to develop and demonstrate new and advanced capture technologies.

Scope: The objective is the demonstration validation and of advanced capture technologies that have shown a high potential for reduction of the energy penalty and a significant overall improvement of cost-efficiency of the whole capture process, but that are not yet commercial. Projects will test operating conditions and provide proof of the reliability and cost-effectiveness of these concepts, whilst at the same time accounting for the cost and safety impacts on the associated transportation infrastructure and storage. The proposal should state credible and clearly defined targets and key performance indicators (KPIs) for the energy penalty reduction, the capture rate and the relative incremental operating costs of the capture process. Environmentally benign technologies have to be pursued and their environmental impact addressed in the project also in view of future scaling up.

Proposals are expected to bring technologies to TRL 6-7 (please see part G of the General Annexes).

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 5 to 10 million (depending on the degree of demonstration) 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, step-change advances in the state-of-the-art - i.e. in reductions in energy penalty and thus in the fuel-dependent cost of capture - which will lower the barriers to the wider uptake of CCS, in particular for those sectors vulnerable to carbon leakage such as steel, lime and cement and petrochemicals.

Type of action: RIA

### ***CE-SC3-NZE-2018: Conversion of captured CO<sub>2</sub>***

Specific challenge: Using captured CO<sub>2</sub> and hydrogen made from renewable energy to produce fuels is not only a means to replace fossil fuels, but also a promising solution for seasonal energy storage. There are still relevant and significant scientific and technological challenges to be able to exploit the CO<sub>2</sub> as a chemical and fuel feedstock in a systematic manner, the main challenge being that the chemical utilisation of CO<sub>2</sub> is limited by its low energy content, and the conversion process is highly energy intensive.

Scope: Development of energy-efficient CO<sub>2</sub> utilisation technologies for chemical energy storage or displacement of fossil fuels that allow for upscaling in the short to medium term. Proposals have to clearly document the potential for the proposed CCU solution(s) as CO<sub>2</sub> mitigation option, including the development of LCA guidelines for CCU that facilitates comparison among technologies. Proposals have to set clear targets for energy requirements of the conversion process, production costs and product yields.

Proposals are expected to bring technologies that have reached at least TRL 3-4 to TRL 5-6 (please see part G of the General Annexes). Technology development has to be balanced by progressing the societal readiness level of the proposed innovations, for example by identifying and involving relevant end users and societal stakeholders in order to create awareness, gain feedback on societal impact and advancing society's readiness for the proposed solutions.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 3 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.

This topic contributes to the SPIRE cPPP and to the focus area "Connecting economic and environmental gains – the Circular Economy".

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with relevant Mission Innovation<sup>65</sup> countries such as China<sup>66</sup>.

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<sup>65</sup> <http://mission-innovation.net/our-work/innovation-challenges/>

<sup>66</sup> A Co-funding mechanism is in place in China; see <https://ec.europa.eu/programmes/horizon2020/en/news/eu-china-research-and-innovation-co-funding-mechanism-first-call-launched-china>

Expected impact: New solutions for the conversion of captured CO<sub>2</sub>, either from power plants or from carbon-intensive industry, to useful products such as fuels or chemicals (CCU) will create new markets for innovative industrial sectors, diversifying the economic base in carbon-intensive regions, as well as contribute to achieving a Circular Economy.

Type of action: RIA

### ***LC-SC3-NZE-2-2018: Strategic planning for CCUS development***

Specific challenge: Establishing the necessary infrastructure for CO<sub>2</sub> transport and storage is of high importance. Early CCS projects will most likely explore CO<sub>2</sub> storage sinks in the vicinity of capture points, and the required infrastructure will therefore most likely be initiated at national level in CO<sub>2</sub> hubs and industrial clusters in order to achieve economies of scale by sharing CO<sub>2</sub> transport and storage infrastructure. A cross border transport infrastructure is ultimately necessary to efficiently connect the CO<sub>2</sub> hubs and industrial clusters to sinks.

Scope: Elaboration of detailed plans for comprehensive CO<sub>2</sub> gathering networks and industrial clusters linked to CO<sub>2</sub> storage sites via hubs, pipeline networks and shipping routes, with due attention to border-crossing issues. Mapping and understanding the nature and longevity of emission sources, identification of transport corridors and performing initial impact assessments, and developing local business models for delivery of CO<sub>2</sub> capture, transport, utilisation and/or storage (including the separation of capture, transport and storage responsibilities) within promising start-up regions. Industrial clusters can include for example power producers, cement and steel factories, chemical plants, refineries and hydrogen production facilities. The detailed appraisal of cost-effective ('bankable') storage capacity in selected regions is a key component of strategic planning, as it will provide additional certainty that the required CO<sub>2</sub> storage capacity will be available when needed. Due attention has to be given to regions with potential for early onshore storage development (including enhanced oil recovery). Close cooperation with industrial players, as well as engagement with local stakeholders, is paramount.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 2 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: Timely strategic planning will enable and accelerate the roll-out of a CCS infrastructure consisting of capture points and clusters, intermediate hubs, CO<sub>2</sub> conversion facilities, CO<sub>2</sub> transport and storage. A hubs-and-clusters approach can also act as a catalyser for coupling hydrogen production and CCS, possibly using common infrastructure. Projects should pave the way for the development of operational storage sites as from the early 2020's, in particular linked to carbon-intensive industry. Proposals should clearly demonstrate how their outputs will contribute to achieving these expected impacts in the short term (up to 3 years), medium term (3-10 years) and long term (more than 10 years).

Type of action: CSA

### ***LC-SC3-NZE-3-2019: Demonstrating the full CCS chain at commercial scale<sup>67</sup>***

Specific challenge: The success of first-of-a-kind industrial CO<sub>2</sub> capture and offshore geological storage is vital for the future of CCS in Europe.

Although industrial-scale CCS is technically ready for demonstration, and significant efforts have already been made to prepare for the construction of capture plants, its implementation hinges on overcoming the poor business case and the lack of public acceptance.

Successful implementation would be instrumental in demonstrating its technical and economic viability, the safety and reliability of CO<sub>2</sub> storage, and in creating public awareness. In addition, it may trigger more exploration and pre-commercial validation of CO<sub>2</sub> storage and development of transport infrastructure in the North Sea.

The timely demonstration of the integrated CCS chain at large scale within Europe is essential especially in order to:

- demonstrate the possibility of retrofitting fossil fuel power plants with CCS;
- maintain EU technology leadership in CCS as a key greenhouse gas abatement technology which has the prospect of worldwide deployment;
- gain operational experience and identify key areas for improvement as well as further research needs.

Scope: The project will support the operation of a CO<sub>2</sub> capture plant demonstrating the application of CCS technology to a commercial fossil fuel power plant with the subsequent transport and permanent geological storage of the CO<sub>2</sub>.

European cooperation is needed to leverage the funding required for the operational phase of first-of-a-kind industrial CO<sub>2</sub> capture and offshore geological storage. Operation for a relevant period of time (in the order of two years) will have a highly innovative dimension, allowing for essential knowledge and experience to be accumulated. Since deployment of CCS also requires a social license to operate, proposals have to include multi-actor engagement to create awareness and gain feedback on societal impact, and enabling easier access to scientific results.

The project has to envisage and show evidence of co-funding from other EU, national, regional or private sources in order to demonstrate a strong commitment towards deployment of CCS in carbon-intensive regions. Any such co-funding has to be fully secured before the signature of the grant agreement to ensure timely realisation of the project.

Expected impact: Operation of the full CCS chain for a limited period of time, but under fully realistic (industrial) conditions will provide the confidence of stakeholders (industry, governments, citizens). Proposals should clearly demonstrate how their outputs will contribute to achieving these expected impacts in the short term (up to 3 years), medium term (3-10 years) and long term (more than 10 years).

Type of action: IA

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<sup>67</sup> 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.

### ***LC-SC3-NZE-4-2019-2020: Low carbon industrial production using CCUS***

Specific challenge: CCS in industrial applications faces significant challenges due to its high cost and the fierce international competition in the sectors concerned. However, these sectors currently account for 20% of global CO<sub>2</sub> emissions, and in the 2 degree scenario, should represent half of the stored CO<sub>2</sub> by 2050. Relevant sectors with high CO<sub>2</sub> emissions are for example steel and cement making, refining, gas processing, hydrogen production, biofuel production and waste incineration plants.

Scope: Projects will address the full CCS chain, from demonstrating the capture of CO<sub>2</sub> from industrial (non-power) installations to the detailed planning of its subsequent transport, utilisation and/or underground storage. Important aspects to address are of technical (e.g. the optimised integration of capture plant with industrial processes; scalability; CO<sub>2</sub> purity), financial (e.g. cost of capture; cost of integration) and strategic nature (e.g. business models; operation and logistics of industrial clusters and networks).

Projects are expected to bring technologies to TRL 7 (please see part G of the General Annexes). Technology development has to be balanced by progressing the societal readiness level, i.e. testing the technological solutions in the relevant context in co-operation with relevant stakeholders in order to create awareness, gain feedback on societal impact and advancing society's readiness for the proposed solutions. Proposals should also explore the socio-economic and political barriers to acceptance and awareness with a view to regulatory or policy initiatives.

The Commission considers that proposals requesting a contribution from the EU in the range of 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.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation is encouraged, in particular with relevant Mission Innovation<sup>68</sup> countries such as China<sup>69</sup>.

Expected impact: Successful demonstration of integrated-chain CCS from industrial sources will accelerate the learning, drive down the cost and thus help break the link between economic growth and the demand for industrial output on one hand, and increasing CO<sub>2</sub> emissions on the other hand. The impact of projects under this call will to a large extent be determined by the degree to which the captured CO<sub>2</sub> will be actually utilised and/or stored, either in the project or planned as a future phase. This will be evaluated based on the maturity and granularity of, and commitment to, the proposed post-capture solutions. Projects under this call that are carried out in areas where there is both a high concentration of CO<sub>2</sub> emitting industries and a nearby capacity for geological storage are considered prime sites for hub and cluster developments, and will generate the highest impact on full-scale deployment in the medium to longer term.

Type of action: IA

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<sup>68</sup> <http://mission-innovation.net/our-work/innovation-challenges/>

<sup>69</sup> A Co-funding mechanism is in place in China; see <https://ec.europa.eu/programmes/horizon2020/en/news/eu-china-research-and-innovation-co-funding-mechanism-first-call-launched-china>

### ***LC-SC3-NZE-5-2020: Integrated solutions for flexible operation of fossil fuel power plants through power-to-X and energy storage***

Specific challenge: With a growing share of energy produced from renewable resources (RES), fossil fuel power plants will have to increasingly shift their role from providing base-load power to providing fluctuating back-up power in order to control and stabilise the grid. Although demand response and storage are expected to play a growing role in balancing electricity demand and supply, a highly flexible thermal generation capacity will continue to be needed in the near future.

Scope: Demonstration of flexible operation of fossil fuel power plants operation through the integration of energy storage and/or use of excess energy (including via power-to-heat and power-to-gas), as well as a better integration of combined production of heat and power into the overall system.

Proposals are expected to bring technologies to TRL 6-7 (please see part G of the General Annexes). Technology development has to be complemented by activities to create awareness, gain feedback on societal impact and advancing society's readiness for the proposed solutions.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 3 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: Solutions will contribute to a smart, secure and more resilient power system through the flexibilisation of fossil fuel power generation through the combined production of heat and power as well as the integration of storage and use of excess energy. Results of the project(s) should allow thermal generators to improve their flexibility, efficiency and environmental performance, and retain their competitiveness by shifting away from baseload generation towards flexible/backup generation and system service provision.

Type of action: IA

## **7. Joint Actions between countries**

The Commission Communication "Towards an Integrated Strategic Energy Technology (SET) Plan"<sup>70</sup> reiterates that achieving the objectives and ambitions of the Energy Union requires more effective coordination of research and innovation (R&I) activities to avoid unnecessary duplication of funding and efforts. Partnerships between organisations in the public sector, or between public and private sector entities involved in funding energy R&I activities, are a crucial means of achieving this goal. The Communication also calls for more joint actions, and specifically mentions Horizon 2020 instruments as a concrete way to support this objective.

Public funding is essential in supporting new technologies in their early stages, and has been fundamental in the past in providing the EU with a competitive edge in various energy technologies. But public funding accounts for only around 15% of all energy R&I funding in the EU (excluding the nuclear sector), with the rest provided by the private sector. And of

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<sup>70</sup> C(2015) 6317

this, only 3% is funding from EU programmes, with the rest coming from national R&I programmes<sup>71</sup>. It is therefore crucial that public funding is used as effectively as possible.

The SET Plan provides the strategic framework for the best possible use of this funding. Topics in this section complement the activities of other public funders in Europe by focusing on activities with clear European Union added value, and in particular on those with a high potential to leverage funding from other sources and therefore maximise the reach of Horizon 2020. This is a crucial objective of the SET Plan as well as the overall goal of the European Research Area.

This section of the Work Programme provides support for public partnerships between European, national and regional funding agencies and procurers through the use of several Horizon 2020 instruments.

Topics LC-SC3-JA-3-2018 and LC-SC3-JA-4-2018 are linked to Africa and the opportunities it presents for European research and industry. R&I cooperation in this area will reinforce the EU commitments under the Paris Agreement, the Agenda 2030 on Sustainable Development and the Cotonou Agreement. This initiative contributes to achieving the Sustainable Development Goal on energy by ensuring access to affordable, reliable, sustainable and modern energy for all. It will also contribute to the priorities set up by the EU-Africa High Level Policy Dialogue on Science, Technology and Innovation.

Specific actions may be introduced in the work-programme to contribute to the accomplishment of the Implementation Plans produced by of the SET Plan Temporary Working Groups to meet the targets described in the corresponding Declarations of Intent<sup>72</sup>.

### ***LC-SC3-JA-1-2018: Joint programming actions to foster innovative energy solutions<sup>73</sup>***

**Specific Challenge:** The EU needs to accelerate the transformation of its energy system by bridging the gap between research and commercial deployment with innovative solutions. Bridging this gap often requires substantial volumes of investment which cannot be allocated by individual countries or by the European Commission on their own (e.g. European Union funding represents only 3% of the total energy R&I funding available across Europe). 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 an integrated European R&I approach which accelerates the

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<sup>71</sup> SWD(2017) 32

<sup>72</sup> <https://setis.ec.europa.eu/implementing-integrated-set-plan>

<sup>73</sup> 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.

transformation of the energy system. It is therefore politically important to support ERA-NETs and to facilitate their existence as much as possible.

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.

Scope: Actions should aim at coordinating the efforts of participating Member States, Associated Countries and Regions in two areas: renewable energy technologies and energy system modelling.

- a. In the case of *renewable energy technologies*, one or more actions will be funded, to a maximum EU contribution of EUR 10 million in total. The action(s) should aim at coordinating demonstration efforts in the areas and challenges targeted in the 'Number 1 in renewable energy' and in the 'Diversify and strengthen energy options for sustainable transport' of the Integrated SET Plan<sup>74</sup>, or in the resulting Declarations of Intent<sup>75</sup>.
- b. In the case of *energy system modelling*, only up to one action will be funded, to a maximum EU contribution of EUR 5 million. The action should promote the convergence of modelling practices at regional, national and European levels, allowing an assessment of cross-border effects and the comparison and integration of individual approaches.

Proposals will pool the necessary financial resources from participating national or regional research programmes with a view to implementing multiple joint calls for proposals resulting in grants to third parties, the first of which will receive EU co-funding. Proposers will also implement other joint activities, including additional joint calls without EU co-funding.

Participation of legal entities from third countries on the basis of common interest and mutual benefit is encouraged in the joint calls and in additional joint activities.

Expected Impact: It is expected that actions will help to:

- Establish long-lasting joint programming research efforts between Member States/Associated Countries/Regions in areas of common interest;
- Accelerate the time to commercial deployment 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;

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<sup>74</sup> C(2015)6317, pp.10-13: key actions no.1 (sustain technological leadership by developing highly performant renewable technologies and their integration in the EU's energy system), no.2 (reduce the cost of key technologies) and no.8 (strengthen market take-up of renewable fuels needed for sustainable transport solutions).

<sup>75</sup> <https://setis.ec.europa.eu/implementing-integrated-set-plan/no-1-renewables-ongoing-work>  
<https://setis.ec.europa.eu/implementing-integrated-set-plan/renewable-fuels-and-bioenergy-ongoing-work>

- 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;
- Achieve a public funding leverage effect of at least 5:1 between national, regional and private sector contributions, on the one hand, and EU contributions on the other.

In addition, proposals focused on *energy system modelling* are expected to:

- Improve understanding of energy systems by enhancing the transparency of modelling engines and making data and knowledge more widely available. Increase sharing modelling infrastructures and databases;
- Increase convergence of modelling practices and of their use in defining low-carbon transition pathways at regional, national and European level;
- Expand the scope of energy system models to encompass the new challenges posed by the energy transition driven by the Energy Union and its targets and objectives for 2020, 2030 and 2050;
- Better represent the determinants, barriers and impacts of investments by actors: individuals, communities, and private and public actors. Allow better design and representation of policy measures that address barriers and market failures;
- Increase openness, transparency and user-friendliness in open collaborative research on energy system modelling, and provide a better assessment of policy options by civil society;
- Provide a clearer understanding of the macro-economic impacts of the low-carbon transition.

Type of Action: ERA-NET Cofund

### ***LC-SC3-JA-2-2019: European Pre-Commercial Procurement Programme for Wave Energy Research & Development***

Specific challenge: The challenge is the design, development and validation of cost-effective Wave energy converters that can survive in a harsh and unpredictable ocean environment as the ocean through demand-driven Pre-Commercial Procurement. The challenge is open to proposals seeking to steer wave energy research and development in an effective way at a European level establishing convergence of wave energy technologies and to bring these technologies to the market.

Scope: In the past years, Member States and the European Commission have been working closely together to use their public resources via previous Ocean ERA-NET Cofund actions but like to reinforce their cooperation to address the challenge through a different funding instrument. In this European PCP action it is the aim to elevate experience with national public procurement approaches at a European level to bring European Wave Energy Research and Development more efficiently into the direction of commercialization.

The proposed action is to be structured along the following phases:

Preparation phase: The participating users/buyers of R&D service should agree on common performance levels and associated specifications for the wave energy systems. The action should introduce the ocean energy phase gate procedure on a European level.

They will plan the research and the design of actions covering a broad variety of issues. The PCP will consist of several building blocks addressing different sub-challenges. The funding of the participating programme owners (national and/or regional) and the European Union will be used for different stages in the wave energy technology development. The results of phase 1 should lead to calls for tenders (for the procurement of R&D services) which focus on clearly identified technologies which contribute to the development of commercial wave energy devices. The procurement should be also open for developers, researcher organisations which are not located in the participating countries/regions.

The expected outcomes at this stage: 1) completed tender documents, 2) signed joint procurement agreement confirming the collaboration modus including the financial commitment of the buyers group and 3) final confirmation of the lead procurer.

Execution stage: The action will take care for the implementation of the Pre-Commercial Procurement and of the PCP contracts. The results will be shared within the European industry to accelerate technology development and the establishment of guidelines and standards to facilitate the transferability of the knowledge creation. The research and specification work should lead to at least 3 prototypes tested in an environment close to expected performance. At the end of the action at least one of the prototypes should be ready for testing in an operational environment at commercial scale.

Proposals have to describe the jointly identified challenge, indicating how it fits into their mid-to-long term innovation plans, why solutions currently available on the market or under development are not meeting their needs. Activities have to include: (1) networking related to preparation, management and coordination and (2) joint research activities related to the validation of PCP strategy.

The consortium should have at least three legal entities established in different member states or H2020 associated countries. In the consortium the participation of minimum two 'public procurers' is required. Other entities might be considered which can have a clear added value in the preparation and/or execution of the PCP or in coordination and networking activities.

For the action the specific requirements for the PCP in General Annex E of the H2020 Work programme have to be followed. Please see part E of the General Annexes.

The Commission considers that PCP proposals requesting a contribution from the EU of between 15 and 20 million would allow this area to be addressed appropriately. Nonetheless, this does not preclude submission a selection of proposals requesting other amounts. It is expected that the group of procurers will leverage the EU contribution at least with a factor 2.5.

Expected impact:

- Convergence of wave energy technologies, acceleration of technology development, proof-of-concept and validation of wave energy technology for the benefit of the wave energy sector and as such improved knowledge transfer.
- Pool resources at national and EU levels dedicated to Research and Development and provide effectively a significant developmental boost of wave energy technology.
- More effective use of public resources for Research and Demonstration.

Type of Action: Pre-Commercial Procurement (PCP)

Funding rate:

### **Renewable energy solutions for Africa: International Dimensions**

Africa (and South-Saharan Africa in particular) represents opportunities for the European research and industry. R&I cooperation in this area will reinforce the EU commitments under the Paris Agreement, Agenda 2030 on Sustainable Development and Cotonou Agreement. This initiative contributes to the Sustainable Development Goal on energy, by ensuring access to affordable, reliable, sustainable and modern energy for all. It will also contribute to the priorities set up by the EU-Africa High Level Policy Dialogue on Science Technology and Innovation.

#### ***LC-SC3-JA-3-2018: Support action in preparation of a Joint Programming<sup>76</sup>***

Specific challenge: Providing sustainable and affordable energy to sub-Saharan Africa is critical to the development of a region that accounts for 13% of the world's population, but only 4% of its energy demand. Sub-Saharan Africa's energy resources are more than sufficient to meet its demands, but they are unevenly distributed and under-developed (IEA, 2014).

Building local capacities and promoting research, including applied research, are recognized to be essential pillars in the development of sustainable energy in Africa. Africa-EU research cooperation in this area can contribute substantially to further technology take-up in the region. It can also strengthen the market position of involved European institutions through increased knowledge and competitive capacity.

Several initiatives in the past decade have launched support projects aiming to promote research addressing African energy challenges. The participation of African researchers in related calls has however remained limited. African scientists and researchers in general are underrepresented in the international arena: there are only few scientific publications or patent applications related to renewable energy, and limited participation in international conferences. In addition to the limited exposure the international scientific community, limited research capacities both in the sense of human capital and financial resources hinder better representation of African researchers in abovementioned funding schemes.

Following the EU commitments under the Paris Agreement, Agenda 2030 on Sustainable Development and Cotonou Agreement, research and innovation cooperation in the field of renewable energy generation technologies between EU and Africa needs to be strengthened and further developed. Coordination of the existing bilateral activities between European and African countries is advisable. The challenge is bringing together the national funding agencies of EU member states and African states interested in developing joint research activities between the two continents to create synergies and to push forward common research and innovation cooperation in the field of renewable energy generations.

Scope: The proposal will be the preparatory step towards the European Joint Programme, topic LC-SC3-JA-4-2019. The consortium has to bring together the core relevant European

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<sup>76</sup> 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.

funding agencies and African partners already involved research and innovation cooperation actions.

The fields of activities to be programmed will cover the research and development of new or of the adaptation of renewable energy generation technologies to the African environmental, social and economic conditions, of providing affordable access to renewable energy and of improving the innovation cycles.

The objectives will be the development a common strategic joint research and innovation programme on renewable energy technology and to establish its organisational principles that could lead to a European Joint Programme. The common strategic joint programme needs to create synergies with existing African-European programmes such as the Africa-EU Energy Partnership, the EU Energy Initiative, the Africa Renewable Energy Initiative and the EU-Africa Research and Innovation Partnership.

The estimated duration to achieve these objectives is approximately 12 months.

Expected impact: The expected impact will be firstly the achievement of the joint commitments necessary to propose and to implement a European Joint Programme, secondly the identifications through its strategic joint programme of the essential research and innovation activities needed to reinforce and to boost European and African research cooperation.

Type of Action: CSA

***LC-SC3-JA-4-2019: Joint Programming with EU and African partners for a R&I actions in the area of renewable energy***<sup>77</sup>

Specific challenge: Providing sustainable and affordable energy to sub-Saharan Africa is critical to the development of a region that accounts for 13% of the world's population, but only 4% of its energy demand. Sub-Saharan Africa's energy resources are more than sufficient to meet its demands, but they are unevenly distributed and under-developed (IEA, 2014).

Building local capacities and promoting research, including applied research, are recognized to be essential pillars in the development of sustainable energy in Africa. Africa-EU research cooperation in this area can contribute substantially to further technology take-up in the region. It can also strengthen the market position of involved European institutions through increased knowledge and competitive capacity.

Several initiatives in the past decade have launched support projects aiming to promote research addressing African energy challenges. The participation of African researchers in related calls has however remained limited. African scientists and researchers in general are underrepresented in the international arena: there are only few scientific publications or patent applications related to renewable energy, and limited participation in international conferences. In addition to the limited exposure the international scientific community, limited research capacities both in the sense of human capital and financial resources hinder better representation of African researchers in abovementioned funding schemes.

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<sup>77</sup> 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.

Following the EU commitments under the Paris Agreement, Agenda 2030 on Sustainable Development and Cotonou Agreement, research and innovation cooperation in the field of renewable energy generation technologies between EU and Africa needs to be strengthened and further developed. Coordination of the existing bilateral activities between European and African countries is advisable. The challenge is bringing together the national funding agencies of EU member states and African states interested in developing joint research activities between the two continents to create synergies and to push forward common research and innovation cooperation in the field of renewable energy production and use.

Scope: The proposal will implement the common strategic joint research and innovation programme on renewable energy technology developed in the preparatory phase, topic LC-SC3-JA-2-2018, to adapt renewable energy technologies to the African environmental, social and economic conditions through joint research efforts.

The range of activities can include research projects, demonstration projects, technology transfer projects, and exchange of researchers between European and African actors. The activities will also create synergies with existing development programmes.

Expected impact: The expected impacts are firstly the creation of long lasting research and development cooperation between European and African stakeholders through common understanding and trust, secondly the development of vibrant research and industrial frameworks and thirdly the development of renewable energy.

Type of Action: EJP

## **8. Cross-cutting issues**

### ***LC-SC3-CC-1-2018-2019-2020: Social Sciences and Humanities (SSH) aspects of the Clean-Energy Transition***

Specific Challenge: The clean-energy transition doesn't just pose technological and scientific challenges; it also requires a better understanding of cross-cutting issues related to socioeconomic, gender, sociocultural, and socio-political issues. Addressing these issues will help to devise more effective ways of involving citizens and to better understand energy-related views and attitudes, ultimately leading to greater social acceptability as well as more durable governance arrangements and socioeconomic benefits.

Scope: Proposals should address one or several issues under one of the two sub-headings below (a comparative perspective, with case studies or data from at least three European Union Member States or Associated Countries, will be considered an advantage):

2018:

*Social innovation in the energy sector:* The energy transition has given rise to various forms of social innovation, such as the emergence of energy cooperatives or that of energy "prosumers" consuming but also producing energy. Urban areas have emerged as major hubs for these trends, given the close proximity between citizens, businesses and institutions, facilitating linkages between sectors and the emergence of new business and service models, as well as associated governance arrangements. These issues need to be studied in more detail, with a particular focus on the following questions:

- What characterizes successful examples of social innovation in the energy sector?

- What enabling conditions facilitate social innovation in the energy sector and how can it be encouraged? What factors work against it?
- In what way does social innovation contribute to the preservation of livelihoods and the development of new business and service models in the energy sector?
- In what way does social innovation contribute to making energy more secure, sustainable and affordable? Does social innovation lead to greater competitiveness and if so, how?
- Under what conditions does social innovation lead to greater acceptance of the transition towards a low-carbon energy system?

2019:

*Challenges facing carbon-intensive regions:* The transition to a low-carbon energy system and economy poses particular challenges for regions heavily dependent on fossil-fuel-based industries or the extraction of fossil fuels themselves. At the same time, this transition offers major opportunities for developing new lines of business and for increasing the competitiveness of structurally weak regions. Particular attention should be focused on the following issues:

- What are the principal socio-economic challenges facing carbon-intensive regions and what effect have these had on livelihoods and the sustainability of local and regional economies?
- What coping strategies have emerged? What are the principal differences between regions that have coped well and those that have not?
- To what extent have carbon-intensive regions experienced outward migration and in what way has this affected their social and demographic composition?
- What effect, if any, have these changes had on the rise of populism and of anti-democratic attitudes in the regions concerned?

2020:

*To be added*

The Commission considers that proposals requesting a contribution from the EU of between EUR 1 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: The proposed research will:

- provide a better understanding of socioeconomic, gender, sociocultural, and socio-political factors and their interrelations with technological, regulatory, and investment-related aspects that are crucial for the progress of the clean-energy transition;
- further the achievement of the goals of the Energy Union and particularly its research and innovation pillar, as expressed in the "Accelerating Clean Energy Innovation" Communication<sup>78</sup>, the continued implementation of the integrated Strategic Energy Technology (SET) Plan and the goals of the Mission Innovation initiative.

Type of Action: RIA

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<sup>78</sup> COM (2016) 763

***LC-SC3-CC-2-2019: Support for the opening of low-carbon energy research databases in Europe***<sup>79</sup>

Specific Challenge: Recent advances in the collection and exploitation of large data sets open the possibility for major industrial and social innovations. The European Open Science Cloud initiative aims to maximise the incentives for sharing data and to increase the capacity to exploit them, to ensure that data can be used as widely as possible.

Increasing aspects of research in the transition to a low-carbon energy system in Europe rely on the collection, analysis and processing of large data sets. Insights, information and knowledge are increasingly extracted from data sets in individual sectors and in the combination of data from different sectors.

The challenge is to promote the opening of research databases for low-carbon energy in Europe, and to support a European-level approach to defining the development of future research data bases; this action focuses on the area of low-carbon energy. As the energy transition combines different scientific disciplines, particular attention has to be paid to agreed metadata in order to allow for the joint exploitation of data from these disciplines.

Scope: Proposals will develop together with energy research communities several of the items below. A broad coverage will increase the impact of the proposed approach and will be considered under the impact criterion.

- Development and use of data management practices that follow findable, accessible, interoperable, re-usable (FAIR) principles, and to the validation of data quality measures;
- Coordination of existing data repositories and databases, including those from SETIS and from the IEA;
- Access to tools to manage energy data with FAIR principles; promotion of open source access of such tools;
- Access to analytics to exploit energy data; promotion of open source access of such tools;
- Capacity building of data experts for the domain of low-carbon energy research;
- New research topics based on the analysis of large data sets in the energy domain;
- Trans-disciplinary research combining data from different domains and at different scales.

Recommendations that will be produced by the ongoing study on "*Opportunities and barriers for opening of research databases in low-carbon energy research*" should be taken into account<sup>80</sup>.

Proposals should also follow developments of the European Open Science Cloud initiative, and plan to cooperate with and complement this activity.

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<sup>79</sup> 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.

<sup>80</sup> To be published in the first half of 2018 on <https://bookshop.europa.eu/en/home/>

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:

- Increasing/extending/widening the use of low-carbon energy research databases, particularly those from publicly financed R&I projects.
- Development of a critical mass of open research databases in Europe, and of researchers equipped with the know-how for the deployment, maintenance and exploitation of these.
- Easy and open access to these databases and to tools for their elaboration and exploitation, leading to increased efficiency of research investments.
- Strengthening of data-intensive research on low-carbon energy in Europe.

Type of Action: CSA

***LC-SC3-SC3-CC-3-2018: Support to sectorial fora<sup>81</sup>***

Specific Challenge: The transition to a low-carbon energy system poses a unique set of policy, technological and scientific challenges, changes the fundamental nature of the interrelations between all actors in our societies (from energy incumbents to regulators and citizens), and requires the engagement of all stakeholders. Not only is there 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 a better understanding of how these changes impact people's behaviour, pervasive values, cultures of practice and modes of communication. It also entails the need to engage all stakeholders, foster cooperation between them, align their actions to the achievement of commonly agreed goals.

Scope: Proposals will have to support sector-specific stakeholder fora along the following lines:

- a. Support the coordination of stakeholders' activities in the context of the *SET-Plan European Technology Innovation Platforms (ETIPs)*, in particular in the area of
  - PV,
  - Ocean energy,
  - Wind energy,
  - Bioenergy,
  - Renewable Heating and Cooling (RHC), and
  - Zero emission fossil fuel power plants and energy intensive industry

especially towards the progress of the strategic R&I Implementation Plans identified in the different technological areas in the context of the SET-Plan Key Actions no. 1, 2 and 9.

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<sup>81</sup> 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.

- b. All relevant stakeholders of the *hydropower sector* will be brought together in a forum including workshops and online discussion groups in order to identify research and innovation needs and priorities, to share knowledge at the European level between basic science, the research and industrial value chain, civil society and European and national authorities, to support the discussion with up-to-date information. The forum will produce a synthesis of expected research developments and research needs for the coming decades in a technology roadmap and research and innovation agenda in the hydropower sector, targeting an energy system with high flexibility and renewable share.
- c. Building on the platform for *energy-related SSH research* that was set up during the pilot phase, the dialogue among different SSH stakeholders - as well as with other energy-research communities, fostering interdisciplinarity as well as knowledge and information sharing – should be continued and enhanced. This includes promoting the generation of novel, evidence-based research designed to inform and influence relevant policy processes, particularly in the context of the Energy Union and the transition to a low-carbon energy system. The platform will be sought after by European policymakers as a source of specific expertise and advice on how best to integrate SSH aspects in energy-related policymaking.
- d. Support for the creation and operations of a *European Clean Energy Industrial Competitiveness Forum* which brings together industry, research & innovation community, social partners, and consumers associations in order to optimize the benefits of the clean energy transition for the EU industry and society. The forum should work in close cooperation with already existing fora in different sectors (energy-transport-manufacturing-digital). It should have a European focus, addressing competitiveness and the link between research, innovation and market-uptake, using the SET Plan structures to gather industrial stakeholders. Strong links have to be established with the corresponding sectorial fora in Europe and with other international initiatives in the clean energy domain, such as Mission Innovation and the Breakthrough Energy Coalition.

The Commission considers that proposals requesting a contribution from the EU of up to EUR 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: Coordinated stakeholders' activities in the different sectors, providing specific and extensive advice to EU policymakers on energy-related research policy-making, continuing to foster social innovation and social dialogue in the energy field at European level, contributing towards the progress of the strategic research and innovation Implementation Plans identified in the context of the SET-Plan.

Type of Action: CSA

#### ***LC-SC3-CC-4-2018: Research, innovation and educational capacities for energy transition***

Specific challenge: The energy sector is a rapidly evolving field which creates new job opportunities but at the same time requires the development of new skills and competences. The challenges are significant - on the one hand, a growing low carbon energy sector requires the education, training or re-skilling of a significant number of additional workforces in the coming decades. On the other hand, energy innovation creates a massive need for new talents,

upgrade of existing curricula and programmes, and the incorporation of training in real environment.

Due to the multidisciplinary work in research, innovation, education and training, all with regional, national and global reach, universities are core stakeholders in Europe's energy transition towards a low carbon society. They also are important change agents that will be instrumental in responding to the above mentioned challenges.

In order to ensure that universities as eco-systems are fit for purpose when contributing to the objectives of the Energy Union, and following the SET Plan Education and Training Roadmap<sup>82</sup>, there is a need to foster universities' cooperation with innovative businesses and to adapt/develop appropriate university curricula/programmes. The focus in these activities is on breaking silos among energy technologies and fostering multidisciplinary conducive to addressing the challenges of the energy system as a whole. For this purpose it is crucial to have in place active networks among universities and between universities and business and other innovation actors.

Scope: Proposals will be developed in one or several domains falling under renewable energy and storage and smart energy systems. Proposals have to include energy-relevant social sciences and humanities (e.g. scientists from these fields as partners; scientific subjects as parts of multidisciplinary, special curricula or similar) and apply a transdisciplinary approach.

Proposals will deliver all the following:

- Well operating networks among universities and between universities and business and other innovation actors;
- tools to foster cooperation of networks towards accelerating the energy transition, such as, for example, creation of regional energy innovation hubs;
- university level multidisciplinary curricula/programmes and/or alternative practise-oriented learning formats needed for the acceleration of the transformation of the energy system, including a strong on-line component (e.g. e-learning open access repositories or similar);

Training the trainers should also be addressed by the networks.

The actions are expected to mostly address needs the needs of EU Member States and Countries associated to Horizon 2020. However, in the spirit of the Paris COP21 Agreement, proposals may also address the application of European knowledge on these aspects for the needs of third countries.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 1.5 to 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 funded proposals are expected to contribute to ensuring the existence of researchers, engineers and technicians who are able to generate new knowledge and to meet the requirements of evolving technologies and labour markets.

It is also expected that through networking activities and adapting and/or developing curricula/programmes, the universities will become better equipped for responding to the

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<sup>82</sup> <https://setis.ec.europa.eu/setis-output/education-training-roadmap>

needs of accelerating the transformation of the energy system. In this way universities will also increase their abilities to facilitate that innovative technologies as well as non-technological innovations are swiftly brought to the market and to society. Hence, in general it is expected that funded proposals will provide much more visible impact to the development of a sustainable and affordable energy system for the benefit of all European citizens.

Type of action: CSA

### ***LC-SC3-CC-5-2018: Transition in coal intensive regions***

Specific challenge: The implementation of the EU Energy Union transition towards a low-carbon economy poses significant technological, economic and social challenges, in particular for coal-intensive regions that have to prepare for the phasing-out of coal production, both due to market-driven trends and environmental policies. These regions need an effective roadmap to make the necessary transition to a more diversified economic base and a more sustainable energy system, while safeguarding the social cohesion for communities and regions dependent on coal production.

Smart Specialisation strategies, which are also a precondition for benefiting from European Structural and Investment Funds, are expected to help organise the structural changes. The involvement of the private sector, researchers and local governments in the process of 'entrepreneurial discovery' is a key challenge in itself. Developing joint strategies, built on complementarities and respective strengths, can be valuable for better realising the individual and combined potential of coal-intensive regions.

Scope: The objective is to support European coal-intensive regions to design research and innovation strategies to facilitate their transition towards a sustainable energy system. The proposed action will assist policy makers to develop, implement and review their strategies by providing information, developing methodologies, expertise and advice. Main deliverables are a set of blueprints and tools for Member States and regions. Special consideration will be given to the Implementation Plans jointly developed by European countries, as part of the EU's Strategic Energy Technology Plan (SET Plan).

Specific issues to be addressed include:

- Assist in developing Research and Innovation strategies for smart specialisation, including the development of public R&I capacities, consistent with the SET Plan;
- Investigate the re-skilling needs of the workforce;
- Identification and exchange of best practices, including industrial roadmaps from coal towards new technologies;
- Guidance for the access to available European funds and programmes, such as; (a combination of) the European Fund for Strategic Investments (EFSI), Cohesion Policy funds and Horizon 2020, and leveraging additional national public and private co-financing.

The project should develop synergies and complementarities to the European Commission's Smart Specialisation Platform on Energy (S3PEnergy)<sup>[1]</sup>.

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<sup>[1]</sup> <http://s3platform.jrc.ec.europa.eu/s3p-energy>

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 action should lead to new and deepened cooperation in R&I between coal intensive regions that will facilitate their transition to a more sustainable energy system. This cooperation should in the short to medium term contribute to reach the targets set in the SET Plan and stimulate investment in the low-carbon energy sector, with the long term aim to boost innovation-driven growth and industrial competitiveness, create opportunities for employment, meet the COP21 targets and safeguard environmental protection.

Type of action: CSA

DRAFT

## **Conditions for the call**

Topics (Type of Action)	Budgets (EUR million)			Deadlines
	2018	2019	2020	
LC-SC3-EE-1-2018-2019-2020	9	15	8	one-stage
LC-SC3-EE-2-2018-2019	9	12		one-stage
LC-SC3-EE-3-2019-2020		8	8	one-stage
LC-SC3-EE-4-2019-2020		10	12	one-stage
LC-SC3-EE-5-2018- 2019-2020	5	10	8	one-stage
LC-SC3-EE-6-2018-2019-2020	9	10	12	one-stage
LC-SC3-EE-7-2020			10	one-stage
LC-SC3-EE-8-2018-2019	10	5		one-stage
LC-SC3-EE-9-2018-2019	6	9		one-stage
LC-SC3-EE-10-2018-2019-2020	6	6	6	one-stage
LC-SC3-EE-11-2018-2019-2020	8	10	10	one-stage
LC-SC3-EE-12-2019-2020		8	8	one-stage
LC-SC3-EE-13-2018-2020	8		14	one-stage
LC-SC3-EE-14-2018-2019-2020	4	4	4	one-stage
LC-SC3-EE-15-2018	5			one-stage
LC-SC3-EE-16-2018-2019-	6	12	12	one-stage

2020				
LC-SC3-RES-1-2018	15			two-stage
LC-SC3-RES-2-2020		15		one-stage
LC-SC3-RES-3-2020			5	one-stage
LC-SC3-RES-4-2018,	30			two-stage
LC-SC3-RES-5-2018	10			one-stage
LC-SC3-RES-6-2018	30			one-stage
LC-SC3-RES-7-2019,		28		two-stage
LC-SC3-RES-8-2019		15		one-stage
LC-SC3-RES-9-2020,			25	two-stage
LC-SC3-RES-10-2020			15	one-stage
LC-SC3-RES-11-2018,	30			two-stage
LC-SC3-RES-12-2018	30			one-stage
LC-SC3-RES-13-2018	40			one-stage
LC-SC3-RES-14-2019,		28		two-stage
LC-SC3-RES-15-2019		10		one-stage
LC-SC3-RES-16-2019		25		one-stage
LC-SC3-RES-17-2020			25	two-stage
LC-SC3-RES-18-2020			45	one-stage
LC-SC3-RES-19-2020			25	one-stage
LC-SC3-RES-20-2018	29			two-stage
LC-SC3-RES-21-2018	20			one-stage

LC-SC3-RES-22-2019		26		two-stage
LC-SC3-RES-23-2019		10		one-stage
LC-SC3-RES-24-2019		20		one-stage
LC-SC3-RES-25-2020			25	two-stage
LC-SC3-RES-26-2020			10	one-stage
LC-SC3-RES-27-2018-2019-2020	15	15	15	one-stage
LC-SC3-EC-1-2018-2019-2020	10	15	10	one-stage
LC-SC3-EC-2-2018- 2019-2020				one-stage
LC-SC3-EC-3-2018- 2019-2020	5		5	one-stage
LC-SC3-ES-1-2019-2020	20	30	30	one-stage
LC-SC3-ES-3-2018-2019-2020				one-stage
LC-SC3-ES-7-2019				one-stage
LC-SC3-ES-5-2018-2019-2020	20		20	one-stage
LC-SC3-ES-2-2018-2019-2020		25	25	one-stage
LC-SC3-ES-6-2018-2019-2020				
LC-SC3-ES-4-2018-2019-2020	20	25	35	one-stage
LC-SC3-SCC-1-2018-2019-2020	40	70	70	one-stage
LC-SC3-NZE-1-2018	20			one-stage
CE-SC3-NZE-2018	12			one-stage
LC-SC3-NZE-2-2018	3			one-stage

LC-SC3-NZE-3-2019		25		one-stage
LC-SC3-NZE-4-2019-2020		30	45	one-stage
LC-SC3-NZE-5-2020			20	one-stage
LC-SC3-JA-1-2018 (ERA-NET Cofund)	15			one-stage
LC-SC3-JA-2-2019 (PCP)		20		one-stage
LC-SC3-JA-3-2018 (CSA)	1			one-stage
LC-SC3-JA-4-2019 (EJP)		15		one-stage
LC-SC3-CC-1-2018-2019-2020	10	10	10	one-stage
LC-SC3-CC-2-2019		2		one-stage
LC-SC3-CC-3-2018	8.5			one-stage
LC-SC3-CC-4-2019	7			one-stage
LC-SC3-CC-5-2018	2			one-stage
TOTAL	562.5	573	562	

**Eligibility and admissibility conditions:** The conditions are described in General Annexes B and C of the work programme. The following exceptions apply:

LC-SC3-EE-1-2018-2019-2020, LC-SC3-EE-3-2019-2020, LC-SC3-EE-5-2018-2019-2020, LC-SC3-EE-6-2018-2019-2020, LC-SC3-EE-8-2018-2019, LC-SC3-EE-10-2018-2019-2020, LC-SC3-EE-13-2018-2020,	<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<sup>83</sup>, the following additional eligibility criteria apply:</p> <ol style="list-style-type: none"> <li>1.at least three legal entities shall participate in an action;</li> <li>2.each of the three legal entities shall be established in a different Member State or Associated Country</li> <li>3.all three legal entities shall be independent of each other within the meaning of Article 8 of the Rules for Participation.</li> </ol>
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<sup>83</sup> Transition towards Secure, Clean and Efficient Energy and the Energy Union project are cross-national policy initiatives and priorities aiming at trans-national solutions.

LC-SC3-EE-15-2018, LC-SC3-EE-16-2018-2019-2020, LC-SC3-EC-1-2018-2019-2020, LC-SC3-EC-2-2018-2019-2020	
LC-SC3-RES-3-2019	Participants in the EU actions are required to conclude a coordination agreement with the participants in the corresponding coordinated third-country activities. A final draft of these agreements has to be provided with the proposal.
LC-SC3-RES-16-2019	<p>[PLACEHOLDER]: Taking into account the nature of the activity and with the objective to maximize the European added value and impact of the action, the following restrictions to the general eligibility criteria apply:</p> <p>[Only legal entities established in a Member State or Associated Country are eligible for participation]</p> <p>[Only legal entities established in a Member State or Associated Country are eligible for funding]</p>
LC-SC3-RES-23-2019	Participants in the EU actions are required to conclude a coordination agreement with the participants in the corresponding coordinated third-country activities. A final draft of these agreements has to be provided with the proposal.
LC-SC3-SCC-1-2018-2019-2020	Consortia shall be composed of at least 2 lighthouse cities and 5 follower cities.
LC-SC3-JA-1-2018	<p>Proposals which do not include provision for at least one joint call without EU funding on top of the compulsory co-funded joint call will be considered ineligible.</p> <p>Proposals which do not specify which additional activities will be carried out as part of the action in accordance with the definition given in the relevant part of the General Annexes will be considered ineligible.</p>
Additional or specific eligibility conditions and restrictions to participation will be added for identified topics after final legal review and policy justifications	

## TRANSFORMING THE ENERGY SECTOR THROUGH DIGITISATION

At a time when the energy landscape is undergoing a fundamental change towards decentralisation and decarbonisation, the introduction of new and smarter technologies will make an important contribution. They will help integrate renewable energies from variable and distributed resources in the energy systems and increase efficiency through better monitoring and optimisation of assets.

These technologies can moreover provide an opportunity for the uptake of new energy services and business models enabling consumers in the active participation in the energy system and energy markets.

The Energy Challenge contribute to the Focus Area "Digitising and transforming European industry and services" with the following specific topics which are implemented under the work programme annex of the ICT part (the contribution of the Energy Challenge is matched by a contribution from the ICT part of the H2020 programme):

- DT-10-2018: Internet of Things for Energy: interoperable smart homes & grids;
- ICT-16-2018-19-20: HPC and Big Data enabled Large-scale Test-beds and Applications;
- SU-DS04-2018-2020: Cybersecurity in the Electrical Power and Energy System (EPES): an armour against cyber and privacy attacks;
- LEIT-ICT-X-2019: 5G in the Energy system for mission-critical electricity grid services.

## OTHER ACTIONS

### 1. Horizon Prizes

#### ***OA-HP-1: Horizon prize on Artificial Photosynthesis<sup>84</sup>***

*To be developed further*

Specific Challenge:

Expected Impact:

Eligibility Criteria:

The general rule for prizes is participation by any legal entity, regardless of its place of establishment unless article 7(2) or 7(3) of the RfP apply or the nature of the prize itself implies a geographical limitation.

Exclusion criteria foreseen in the provisions of articles 106(1), 107, 108 and 109 of the Financial Regulation (Regulation 966/2012) will apply. Contestants that have already received an EU or Euratom prize cannot receive a second prize for the same activities.

Award criteria:

The prize will be awarded, after closure of the contest, to the contestants who in the opinion of the jury demonstrate a solution that best addresses the following cumulative criteria<sup>85</sup>:

- *To be added*

The specific rules of the contest will be published in [Year] by the European Commission<sup>86</sup>, which will directly launch and manage the contest and award the prize based on the judgement of independent experts.

Type of Action: Inducement Prize

The common Rules of Contest for Prizes are provided in part F of the General Annexes.

Indicative timetable:

Stages	Date and time or indicative period
Opening of the contest	X quarter of YYYY

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<sup>84</sup> This Horizon Prize will be included in the WP part "EIC preparatory phase"

<sup>85</sup> Further clarification of these criteria might be published in the Rules of Contest

<sup>86</sup> On the [Participant Portal](#) but also actively publicised elsewhere to maximise participation.

Deadline for submission of application	X quarter of YYYY
Evaluation and solutions demonstration (if applicable)	X quarter of YYYY
Award of the prize	X quarter of YYYY

Indicative budget:

***OA-HP-2: Horizon prize for a RESponsible Island -100% renewable electricity, heating, cooling and transport***

Prize for a fully renewable energy island in Europe, which over a one year period demonstrates to be independent from fossil fuels for electricity, heating, cooling and transport.

Specific Challenge: The challenge is to create a fully renewable island in all sectors and by excluding balancing possibilities between the different sectors through compensating accounting. Realisation would be a milestone on the way to a responsible society depending on renewable energy only.

The rationale of proposing a prize for a fully renewable island is given by specific characteristics of islands in the energy context:

- Decentralized grids with local power stations, which are often technically not efficient due to their small size and higher fuel costs (transport). Such a decentralized grid is a perfect testing lab with the opportunity to address for issues like renewables grid stability, grid integration between electricity, heating, cooling and transport demands as well as storage, energy security, cost efficiency of the overall energy system on a small scale and cost-distribution to the customer. Additional benefits can be integrated at the same time (e.g. hydropower storage can address at the same time requirements for water storage for irrigation; bioenergy through the treatment of organic waste etc.).
- No overlap and need to arrange with adjacent societies, often strong coordination of interests within the citizens on the island, taking leverage of the self-RESponsibility on the island.
- Marketing effect of such a prize offers additional possibility for touristic exploitation.

Expected Impact:

- Perfect demonstration example for a fully renewable energy society at small scale with enormous visibility.
- Demonstration of the reliability of a 100% renewable energy grid.
- Potential for multiple implementation on other islands worldwide and other locally isolated grids (e.g. Sub-Saharan Africa).

Eligibility Criteria:

The general rule for prizes is participation by any legal entity, regardless of its place of establishment unless article 7(2) or 7(3) of the RfP apply or the nature of the prize itself implies a geographical limitation.

Exclusion criteria foreseen in the provisions of articles 106(1), 107, 108 and 109 of the Financial Regulation (Regulation 966/2012) will apply. Contestants that have already received an EU or Euratom prize cannot receive a second prize for the same activities.

#### Award criteria:

The prize will be awarded, after closure of the contest, to the contestants who in the opinion of the jury demonstrate a solution that best addresses the following cumulative criteria<sup>87</sup>:

- All the renewable energy consumed on the island shall be produced on the island (max 10% can be imported in form of renewable fuels for transport only purposes and the necessary stability of the grids shall be obtained by integration of renewable energy and storage solutions on the island.
- Consumption of any non-renewable energy shall only be possible as backup up to 5% of the overall energy consumed and the renewable energy quota in transport has to be at least 50%.
- The island must have a sufficient high demand for all 3 energy sectors (electricity, heating and cooling, transport) to be valid as a show case and have at least 2500 inhabitants as average over the year

The specific rules of the contest will be published in [Year] by the European Commission<sup>88</sup>, which will directly launch and manage the contest and award the prize based on the judgement of independent experts.

#### Type of Action: Inducement Prize

The common Rules of Contest for Prizes are provided in part F of the General Annexes.

#### Indicative timetable:

Stages	Date and time or indicative period
Opening of the contest	X quarter of YYYY
Deadline for submission of application	X quarter of YYYY
Evaluation and solutions demonstration (if applicable)	X quarter of YYYY
Award of the prize	X quarter of YYYY

<sup>87</sup> Further clarification of these criteria might be published in the Rules of Contest

<sup>88</sup> On the [Participant Portal](#) but also actively publicised elsewhere to maximise participation.

Indicative budget:

***OA-HP-3: Horizon prize for renewable Cargo - Around the world***

Prize for a 100% Renewable Container Ship Refit with demonstrated intercontinental cargo transport

Specific Challenge: Reducing emissions from the growing shipping sector with renewable liquid fuel drop-in solutions which substitutes bunker oil. Fully renewable cargo transport should be demonstrated around the world on advanced renewable fuels in commercial shipping. Aim is to allow for retrofitting measures for reduction of GHG and Sulphur emissions which is urgently needed in shipping due to the International Maritime Organization agreement.

Expected Impact: To show that reduction of greenhouse gas and sulphur emissions from shipping is possible with the existing commercial fleet and contribute to Energy Union and the specific targets for commercialization of advanced biofuels agreed in the Declarations of Intent with the sectorial stakeholders in the context of the SET-Plan.

Eligibility Criteria:

The general rule for prizes is participation by any legal entity, regardless of its place of establishment unless article 7(2) or 7(3) of the RfP apply or the nature of the prize itself implies a geographical limitation.

Exclusion criteria foreseen in the provisions of articles 106(1), 107, 108 and 109 of the Financial Regulation (Regulation 966/2012) will apply. Contestants that have already received an EU or Euratom prize cannot receive a second prize for the same activities.

Award criteria:

The prize will be awarded, after closure of the contest, to the contestants who in the opinion of the jury demonstrate a solution that best addresses the following cumulative criteria<sup>89</sup>:

- *to be added*

The specific rules of the contest will be published in [Year] by the European Commission<sup>90</sup>, which will directly launch and manage the contest and award the prize based on the judgement of independent experts.

Type of Action: Inducement Prize

The common Rules of Contest for Prizes are provided in part F of the General Annexes.

Indicative timetable:

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<sup>89</sup> Further clarification of these criteria might be published in the Rules of Contest

<sup>90</sup> On the [Participant Portal](#) but also actively publicised elsewhere to maximise participation.

Stages	Date and time or indicative period
Opening of the contest	X quarter of YYYY
Deadline for submission of application	X quarter of YYYY
Evaluation and solutions demonstration (if applicable)	X quarter of YYYY
Award of the prize	X quarter of YYYY

Indicative budget:

***OA-HP-4: Horizon prizes launched under the Work Programme 2016-2017 of the Horizon 2020 Societal Challenge "Clean Secure and efficient energy" (SC3)***

On 4 July 2016 the following Horizon prizes were launched under the Work Programme 2016-2017 of the Horizon 2020 Societal Challenge "Clean Secure and efficient energy" (SC3)<sup>91</sup>.

Prize	Budget – Prize amount	Timeline of the contest	Expected award ceremony
<a href="#">Horizon Prize for CO2 reuse</a>	EUR 1.5 million	4 July 2016 - 03 April 2019	2 <sup>nd</sup> half 2019
<a href="#">Horizon Prize Combined heat and power installation in a hospital using 100% renewable energy sources</a>	EUR 1 million	4 July 2016 - 03 April 2019	Q4 2019
<a href="#">Horizon Prize Combined heat and power installation in a hospital using 100% renewable energy sources</a>	EUR 1 Million	4 July 2016 - 03 April 2019	Q4 2019

The prizes are expected to be awarded in 2019 and provision for the prize amounts must be made accordingly.

Type of action: Inducement prizes

Indicative budget: EUR 3.25 million from the 2019 budget

<sup>91</sup> [As amended, C\(2016\)4614, announcing the prizes.](#)

## **2. Grants to identified beneficiaries**

### ***OA-GIB-1: Support for a network of National Contact Points for the Societal Challenge 'Clean, secure and efficient energy'***<sup>92</sup>

This action aims at facilitate trans-national co-operation between National Contact Points (NCPs) of the Societal Challenge 'Secure, Clean and Efficient Energy' with a view to identifying and sharing good practices, raising the general standard of support to programme applicants, taking into account the diversity of actors that make up the constituency of this Societal Challenge, and raising the average quality of proposals submitted.

The proposal should:

- capitalise on the work carried out in the "C-ENERGY 2020" project, aiming at both enhance the competence of NCPs (e.g. trainings and twinnings) and lowering entry barriers for newcomers (e.g. international brokerage events);
- include specific widening measures (e.g. mentoring, awareness raising, special events etc.) aiming at increasing the awareness and participation of Member States and Associated Countries which have been participating in the programme only at a modest level so far;
- foresee cooperation with other NCP-network projects with a view to create synergies and avoid duplication of efforts;

The duration of the project should not exceed the lifetime of Horizon 2020.

Identified beneficiary: *to be added*

Indicative timetable: 4<sup>th</sup> quarter 2018

Indicative budget: EUR 0.50 million from the 2018 budget

### ***OA-GIB-2: 5th Concerted Action on the Energy Performance of Buildings Directive support to Member States and participating countries for the implementation of the EPBD***

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 General Annexes D and H of the work programme.

Indicative timetable: 2nd quarter 2018

Indicative budget: EUR 5.00 million from the 2018 budget

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<sup>92</sup> 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.

***OA-GIB-3: Support to joint surveillance actions for market surveillance by the Member States with the aim to strengthen coordination between the relevant authorities, share best practices, exploit synergies in product testing and improve compliance with legislation***

Compliance by industry and dealers with EU product efficiency legislation is key to ensure that the EU's energy efficiency targets are met. Non-compliance with these rules is estimated to reduce these savings by at least 10%. Enforcement of this legislation is the sole competence of Member States.

This project aims to improve enforcement in this area by supporting the coordination, monitoring, verification and enforcement activities by national Market Surveillance Authorities, in particular for those products that represent the highest energy saving potential or those that represent new challenges (e.g. newly regulated products).

Type of Action: Grant to identified beneficiary - Coordination and support actions

Indicative timetable: 2nd quarter 2018

Indicative budget: EUR 7 million from the 2018 budget

***OA-GIB-4: Concerted Action on the Energy Efficiency Directive support to Member States and participating countries for the implementation of the EED***

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 General Annexes D and H of the work programme.

Indicative timetable: 2020

Indicative budget: EUR 5.00 million from the 2020 budget

***OA-GIB-5: Support to the coordination of national research and innovation programmes in the areas of activities of the European Energy Research Alliance (EERA)***<sup>93</sup>

The European Energy Research Alliance (EERA) plays a key role in the coordination of European energy research actors along the SET Plan objectives. This includes the participation of the joint programmes of EERA in the definition and accomplishment of the specific sectorial implementation plans with the goal to reach the specific targets previously defined in collaboration with industry and the official representatives of the SET Plan countries.

The action will facilitate the coordination of EERA with the organisations responsible for national research and innovation programmes in the SET Plan Member countries. It will contribute to the coordination of National and European funding programmes to support the SET Plan priorities.

*This action will be revised in view of the EERA new strategy (currently under elaboration).*

### **3. Public procurements**

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<sup>93</sup> 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.

***OA-PP-1: Provision of technical assistance, IT tools, modelling and/or studies to collect and analyse relevant data and to properly assess complex technical, environmental, economic, legal and social aspects of energy efficiency<sup>94</sup>***

The services contracted under this point will provide the Commission with the expertise needed to:

inform policymakers with an objective and unbiased judgement of the likely impacts of different policy options and, allow an efficient implementation and monitoring of existing legislation in the area of energy efficiency (EED and EPBD).

The services will address technical, economical, legal aspects linked to, for example, the analysis of calculation method of Member States, the verification of compliance of national legislative measures implementing the directives, assessments of certain costs and/or benefits of the energy efficiency policies, the support to the standardisation of instruments (calculation methodologies and common certification).

Type of Action: Public Procurement – specific contracts under existing framework contract or service contracts, 6 for 2018, 10 for 2019 and 8 for 2020

Indicative timetable: As from 1<sup>st</sup> quarter 2018 and as from 1<sup>st</sup> quarter 2019 and as from 1<sup>st</sup> quarter 2020

Indicative budget: EUR 1 million from the 2018 budget, EUR 1.5 million from the 2019 budget and EUR 1.5 million from the 2020 budget

***OA-PP-2: Continuation of the Building Stock Observatory and production of relevant bottom-up statistical data on buildings<sup>95</sup>***

3rd<sup>nd</sup> phase of the EU Building Stock Observatory

Type of Action: Public Procurement - 2 direct service contracts

Indicative timetable: 1st quarter 2020

Indicative budget: EUR 1.00 million from the 2020 budget

***OA-PP-3: Study on the role of smart technologies in residential buildings<sup>96</sup>***

Forward looking study to create a better understanding of the role of smart technologies in achieving higher comfort levels and wellbeing for building occupants; the link between buildings quipped for electro-mobility and smart appliances, products and local grid networks; and adaptation of buildings to the needs of an aging population.

Type of Action: Public Procurement – 1 service contracts

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<sup>94</sup> 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.

<sup>95</sup> 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.

<sup>96</sup> 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 2019

Indicative budget: EUR 0.2 million from the 2019 budget.

***OA-PP-4: Multiple Framework contract with reopening of competition for qualified legal, technical and economic expertise in the field of Energy Efficiency to support the Commission in the design, preparation and proper implementation of EU initiatives and legislation in the area of Energy Efficiency***<sup>97</sup>

Indicative budget: No budgetary implication

Type of Action: Public Procurement – 2 specific contracts under Framework contract for services

Indicative timetable: 1st quarter 2018

***OA-PP-5: Support to the initiative on sustainable energy in the defence and security sector***<sup>98</sup>

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 2013<sup>99</sup> and confirmed in the Commission Report COM(2014) 387 final of 24 June 2014<sup>100</sup>. This mechanism focuses 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:

- 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

Indicative timetable: 1st quarter 2019

<sup>97</sup> 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.

<sup>98</sup> 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.

<sup>99</sup> "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>

<sup>100</sup> "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 budget: EUR 0.75 million from the 2019 budget

***OA-PP-5: Provision of technical assistance and/or studies to support the implementation of the heating and cooling strategy***<sup>101</sup>

Assessment of the development of heating and cooling markets, of further energy efficiency potentials and evaluating the effectiveness of Member States' policies

Type of Action: Public Procurement - 3 direct service contracts

Indicative timetable: 2<sup>nd</sup> quarter 2019 and 2<sup>nd</sup> quarter 2020

Indicative budget: EUR 0.9 million from the 2019 budget and EUR 0.5 million from the 2020 budget

***OA-PP-6: Product registration database at EU level***<sup>102</sup>

The study for the review of Directive 2010/30/EU on Energy labelling of energy-related products highlighted non-compliance issues as the main cause of a loss of about 10% of envisaged energy savings from product-specific measures. To correct this policy failure the Commission proposed to establish a product registration database at EU level to support enforcement by Member States. The database is developed under the central management of the Commission and manufacturers will have to register their models before placing them on the market. The database has to be operational (i.e. populated with data and accessible to all users) at the latest by 1/1/2019.

Type of Action: Public Procurement – specific contracts under framework contracts

Indicative timetable: as from 1<sup>st</sup> quarter 2018, as from 1<sup>st</sup> quarter 2019 and as from 1<sup>st</sup> quarter 2020

Indicative budget: EUR 0.70 million from the 2018 budget, EUR 0.50 million from the 2019 budget and EUR 0.50 million from the 2020 budget

***OA-PP-7: Provision of technical assistance, studies and IT tools to collect and analyse relevant data and to properly assess complex technical, environmental, economic, legal and social aspects of different product groups***<sup>103</sup>

Provision of technical assistance, studies and 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 and technical support to the Commission on standardisation work for energy related products.

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- 9 This activity is directly aimed at supporting the implementation of EU legislation and will be implemented by the Commission services.

<sup>103</sup> 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 services will provide preparatory and review studies, technical assistance (including where appropriate IT tools) and impact assessment studies for identified product groups.

Type of Action: Public Procurement - direct service contracts and 20 specific contracts under existing framework contract

Indicative timetable: As of 1st quarter 2018 and as of 1st quarter 2019 and as of 1st quarter 2020

Indicative budget: EUR 2 million from the 2018 budget, EUR 2 million from the 2019 budget and EUR 2 million from the 2020 budget

***OA-PP-8: 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***<sup>104</sup>

Type of Action: Public Procurement – 3 direct service contracts

Indicative timetable: 1st quarter 2018, 1st quarter 2019 and 1st quarter 2020

Indicative budget: EUR 0.3 million from the 2018 budget, EUR 0,3 million from the 2019 budget and EUR 0,3 million from the 2020 budget

***OA-PP-9: Technical assistance for communication and evaluation purposes***<sup>105</sup>

Provision of technical assistance to the Commission for collecting and processing information of all kinds needed for the analysis and promotion of Energy Efficiency projects financed under Horizon 2020, such as the evaluation of the 2nd Concerted Action on the Energy Efficiency Directive; the 4th Concerted Action on the Energy Performance of Buildings Directive; and the 3rd Concerted Action on the Renewable Energy Sources Directive. Services will also address technical assistance related to information and communication, conferences and events promoting activities on energy efficiency, including electronic and paper publications, audio-visual products as well as the development of different web based and social media activities directly linked to the achievement of the objective of the energy efficiency policy.

Indicative timetable: As of 1st quarter 2018 and as of 1st quarter 2018 (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 2018 and as of 1st quarter 2019

Indicative budget: EUR 0.50 million from the 2018 budget and EUR 0.50 million from the 2019 budget

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<sup>104</sup> 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.

<sup>105</sup> 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.

***OA-PP-10: Support to Smart finance for smart buildings initiative<sup>106</sup>***

Provision of technical assistance and studies to collect and analyse relevant data, and to properly assess complex technical, economic and legal aspects of energy efficiency investments financing framework, with an objective to support the development of an investible market framework for energy efficiency. Service contracts to address:

- EEFIG 3.0 activities, studies on the valuation of externalities related to energy efficiency investments,
- Mapping of energy efficiency financing schemes across Europe
- Mapping of energy efficiency services available and progress in setting up one-stop shops in Europe

Type of Action: Public Procurement – 1 direct service contract in 2018, 3 direct service contracts in 2019 and 2 direct service contracts in 2020

Indicative timetable: 2nd quarter 2018, and 2nd quarter 2019 and 2nd quarter 2020

Indicative budget: EUR 1 million from the 2018 budget and EUR 0.9 million from the 2019 budget and EUR 0.8 million from the 2020 budget

***OA-PP-11: Tender on "Energy Efficiency Finance Market Place"***

(Follow up of the on-going "Sustainable Energy Investment Forums" tender, plus enhanced knowledge platform on EE finance)

Type of Action: Public Procurement - direct service contract

Indicative timetable: As of 1st quarter 2018

Indicative budget: EUR 2.2 million from the 2018 budget

***OA-PP-12: Assessment of Finance projects covering PDA, De-risking and Innovative Finance***

Type of Action: Public Procurement - direct service contract

Indicative timetable: As of 1st quarter 2019

Indicative budget: EUR 0.25 million from the 2019 budget

***OA-PP-13: Support facility for public authorities***

Type of Action: Public Procurement - direct service contract

Indicative timetable: As of 1st quarter 2020

Indicative budget: EUR 1.80 million from the 2020 budget

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<sup>106</sup> 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.

***OA-PP-14: Evaluation of projects in Industry area***

Type of Action: Public Procurement - direct service contract

Indicative timetable: As of 1st quarter 2019

Indicative budget: EUR 0.2 million from the 2019 budget

***OA-PP-15: 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 2018 and as of 1st quarter 2019 (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 2018, as of 1st quarter 2019 and as of 1<sup>st</sup> quarter 2020

Indicative budget: EUR 0.50 million from the 2018 budget, EUR 0.5 million from the 2019 budget and EUR 0.5 million from the 2020 budget

***OA-PP-16: Support to Research and Innovation Policy in the areas of Renewable Energy, Carbon Capture and Storage and More Efficient Coal Combustion<sup>107</sup>***

Specific contracts under the Multiple Service Framework Contract 'Studies in Support to Research and Innovation Policy in the areas of Renewable Energy, Carbon Capture and Storage and Clean Coal' – (PP-02161-2014) addressing technical, 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 required in the terms of reference of the specific contracts 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 analysis of trends in the different renewable energy sectors and possible synergies

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<sup>107</sup> 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.

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 - 6 specific contracts in 2018 and 6 specific contracts in 2019

Indicative timetable: as of 1st quarter 2018 and as of 1st quarter 2019

Indicative budget: EUR 3.00 million from the 2018 budget and EUR 3.00 million from the 2019 budget

#### ***OA-PP-17: Dissemination and information activities***

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 2018, 2019 and 2020

Indicative timetable: as of 1 quarter 2018, 2019 and 2020

Indicative budget: EUR 0.20 million from the 2018 budget, EUR 0.20 million from the 2019 budget and EUR 0.20 million from the 2020 budget

#### ***OA-PP-18: Information services for energy research policy development<sup>108</sup>***

An information platform is planned to be used to gain a better understanding of the energy research sector. Intelligence gained through the platform will help to establish priority areas, base policy decisions on hard evidence, and allocate resources optimally.

Type of Action: Public Procurement - 1 service contract in 2018

Indicative timetable: as of 2nd quarter 2018

Indicative budget: EUR 0.08 million from the 2018 budget

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<sup>108</sup> 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.

***OA-PP-19: Study on the impact of projects funded under the Horizon 2020 Energy Challenge<sup>109</sup>***

The study's objective is to investigate the scientific, technological and innovation impact of projects funded under the current and previous European programmes relevant for energy R&I. It should compare the outcomes and impacts of the projects funded under Horizon 2020 with the projects of its predecessor programmes (IEE, FP7), evaluate how Horizon 2020 projects support EU Energy policy priorities, investigate the implementation of the programme and formulate recommendations for future calls and framework programmes.

Type of Action: Public Procurement - 1 specific contract using an existing framework contract

Indicative timetable: 1st quarter 2020

Indicative budget: EUR 0.70 million from the 2020 budget

***OA-PP-20: Support services for exploitation of research results (SSERR)<sup>110</sup>***

A framework contract for Support Services for Exploitation of Research Results SSERR has been concluded in 2015 for four years. This framework contract provides 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 the 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.

The framework contract consists of four predefined support services and two services to be agreed with the beneficiaries on a case-by-case basis. The services involve, inter alia, identification of market potential and opportunities, evaluation of competing technologies, development of business and action plans, pitching results, assessment of the costs for upscaling, and protection of IPR.

Specific contracts will be concluded in 2018 and in 2019 based on the individual needs of the grants to be assisted.

Type of Action: Public Procurement - up to 40 specific contracts in both 2018 and 2019

Indicative timetable: 1st quarter 2018 until 4rd quarter 2019

Indicative budget: EUR 0.30 million from the 2018 budget and EUR 0.30 million from the 2019 budget

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<sup>109</sup> 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.

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***OA-PP-21: Assessment of FCH 2 JU impacts<sup>111</sup>***

The aim of this action is to qualify and quantify the socio-economic, environmental and other impacts generated by the FCH (2) JU, based on evidence from its past actions and extrapolation using planned and potential future actions.

Type of action: Public procurement – contract under existing framework contract

Indicative timetable: 1st half 2018

Indicative budget: EUR 0.10 million from the 2018 budget

***OA-PP-22: Studies on the EU energy system in support of policy<sup>112</sup>***

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 2019

Indicative budget: EUR 3.00 million from the 2019 budget

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<sup>111</sup> 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.

<sup>112</sup> 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.

### ***OA-PP-23: Energy system Modelling<sup>113</sup>***

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, the potential of energy storage, of enhanced regional cooperation, etc. on the transmission network. The modelling suite will include a market layer that allows to study cost of infrastructure depending on scenarios and study the impact of variable prices. A generic distribution network model should allow to investigate for example the impact of variable renewables and of electric vehicles at distribution level.

The modelling effort should also address other energy related networks such as heat, gas or transport (in particular electric vehicles) and their connections with the electricity networks.

Overall, the modelling suite should also allow to compute CO2 emissions.

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 2020

Indicative budget: EUR 3.00 million from the 2020 budget

### ***OA-PP-24: Support to R&I Strategy and feedback to policy in the field of electricity networks and local energy systems<sup>114</sup>***

There are several initiatives at EU level that are relevant to the R&I policy in the field of smart grid, storage and local energy systems:

- The European Technology Platform on Smart Energy Networks for the Energy Transition;
- Actions in the Strategic Energy Technology Plan (currently under Action 4);
- Feedback from ongoing R&I projects, in particular at EU level, to policy makers (BRIDGE initiative, web site link will be available before the publication of the tender).

Support is needed in several aspects

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<sup>114</sup> 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.

- Analysis of ongoing R&I projects, in particular European, to maintain an up to date state of the art;
- R&I roadmaps drafting;
- Coordination of stakeholders inputs, organisation of meetings;
- Communication.

Indicative duration: 48 months

Type of Action: Public Procurement - 1 direct service contract

Indicative timetable: 1st quarter 2020

Indicative budget: EUR 4.00 million from the 2020 budget

#### **4. Provision of technical/scientific services by the Joint Research Centre (JRC)**

***OA-JRC-1: Administrative arrangement with the JRC, to implement the relevant provisions of Energy Efficiency related Directives or Regulations, including Directive 2012/27/EU and the EPBD<sup>115</sup>***

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 2020

Indicative budget: EUR 2.5 million from the 2020 budget

<sup>115</sup>

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.

## 5. Delegation Agreements

### ***OA-DA-1: ELENA (European Local Energy Assistance)<sup>116</sup>***

The ELENA (European Local Energy Assistance) facility was established in 2009 under the Intelligent Energy-Europe Programme II and continued under the H2020 Work Programme 2014-2015 and Work Programme 2016-2017.

The ELENA facility aims at supporting public and private project promoters to prepare and develop ambitious and large-scale (normally above EUR 30 million) investment programmes which will contribute to achieving and going beyond the objectives of the EU energy and climate policy. The ELENA facility aims at mobilising local, regional and national stakeholders towards actions leading to broader utilisation and market uptake of innovative solutions, including technologies, processes, products, policies, organisational models and practices. The objective is also to accelerate investments by increasing experience, facilitating financing, in particular through the aggregation of projects and overcoming existing investment barriers.

The ELENA facility can provide assistance to different type of project promoters such as e.g. local, regional or national authorities, social housing operators, public/private infrastructure operators, estate managers. 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 delegation agreements between the European Investment Bank (EIB) and the European Commission. The EIB will ensure that Project Development Services are being awarded 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 EIB and submitted to the European Commission for approval. The selection of projects shall take into consideration:

- the eligibility of the applicant;
- the eligibility and potential bankability of the proposed investment programme;
- the financial and technical capacity of the applicant to implement and complete the Investment Programme;
- the technical need for the project development services;
- the contribution to the broader utilisation and market uptake of innovative solutions including technologies, processes, products, policies, organisational models or practices;
- the expected Leverage Factor (the cost of the Investment Programme divided by the amount of the ELENA contribution)
- the contribution to EU policies and the EU added value.

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<sup>116</sup> 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.

The technical assistance grants will be provided to the Final Beneficiary in relation to all the activities necessary to develop and mobilise finance for a clearly identified investment programme, including for instance: feasibility studies, design studies, structuring of programmes, business plans, energy audits, legal/financial advisory, preparation of tendering procedures and contractual arrangements, bundling of smaller projects to form bankable packages, set-up and running of a project implementation unit. However, costs related to the investment programme itself such as hardware costs are not eligible. Request for Project Development Services shall be addressed to the EIB according to the standard procedure for the submission of projects to the EIB. Applications are open to all participating countries following the CSA eligibility conditions and are not restricted by the availability of local offices of the EIB in a specific country.

In 2018, 2019 and 2020, the ELENA Facility will aim at supporting ambitious and significant investment programmes in 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;
- development of “one-stop-shops” to accelerate the energy refurbishment of the building stock at local or regional level that cover the whole customer journey from information, technical assistance, structuring and provision of financial support, to the monitoring of savings.
- 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 infrastructures including smart grids, energy efficiency of water infrastructures operation (water pumping, water treatment etc.), information and communication technology infrastructure for energy efficiency, energy-efficient urban equipment and link with transport.

Following areas shall be excluded:

- Stand-alone renewable energy systems, not integrated in buildings or heating/cooling networks, e.g. wind turbines; stand-alone PV, concentrated solar power; hydropower and geothermal electricity production;
- Large industrial facilities (falling under the Emission Trading Scheme Directive), and investments in reducing greenhouse gas emissions due to industry delocalisation.

Type of Action: Delegation Agreement

Indicative timetable: 4th quarter 2018, 4th quarter 2019 and 4th quarter 2020

Indicative budget: EUR 30.00 million from the 2018 budget, EUR 30.00 million from the 2019 budget and EUR 30.00 million from the 2020 budget

## **6. Financial instrument**

### ***OA-FI-1: Support to first-of-a-kind renewable energy projects***

First-of-a-kind, commercial-scale demonstration projects are essential to roll-out new generations of innovative energy technologies to the market. Due to their highly risk nature, however, these projects have been identified by the SET Plan as suffering from a serious market failure in access to finance. The InnovFin Energy Demo Projects (EDP) facility contributes to bridging this gap by supporting the demonstration of the technical feasibility and commercial viability of innovative first-of-a-kind projects in the sector of renewable energy. Such facility contributes to reducing perceived investment risks for private investors. Support is delivered via loans to projects at TRL 7/8 (please see part G of the General Annexes). The European Commission is working towards at least doubling the financial support of EUR 150 million already provided to this facility, using funds channelled from different sources including Horizon 2020.

Type of Action: Financial Instrument

Indicative timetable: as of 1 quarter 2019 and 2020

Indicative budget: contribution to the facility of EUR 50 million from the 2019 budget and EUR 50 million from the 2020 budget

## **7. Specific Grant Agreements**

### ***OA-SGA-1: Technical support to stakeholders on standardisation work for energy related products<sup>117</sup>***

To give support to environmental NGOs for participating in Technical Committees and Working Groups on Standardisation.

Type of Action: Specific Grant Agreement

Two Specific Grant Agreements to identified beneficiary for Coordination and Support Action under Framework Partnership Agreement 1338/G/ENV/ENTR/2014-.

Beneficiary: ECOS, rue d'Edimbourg 26, Brussels 1050, Belgium

Indicative timetable: 2<sup>nd</sup> quarter 2018, 2<sup>nd</sup> quarter 2019 and 2<sup>nd</sup> quarter 2020

Indicative budget: EUR 0.30 million from the 2018 budget, EUR 0.30 million from the 2019 budget and EUR 0.30 million from the 2020 budget

### ***OA-SGA-2: Support to European Standardisation Organisations on standardisation work for energy related products.<sup>118</sup>***

Identified beneficiaries:

CEN – European Committee for Standardisation, Avenue Marnix 17, 1000 Brussels Belgium

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.

Type of Action: Specific Grant Agreement to identified beneficiary for Coordination and Support Action under the Framework Partnership Agreement FPA/CEN/2014.

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, provided that funding rates should be in compliance with the conditions set out in the framework partnership agreement with CEN, in particular according to the scale of unit costs for eligible staff costs established therein and up to 100% for other eligible direct costs.

Indicative timetable: 2<sup>nd</sup> quarter 2018, 2<sup>nd</sup> quarter 2019 and 2<sup>nd</sup> quarter 2020

Indicative budget: EUR 0.30 million from the 2018 budget, EUR 0.50 million from the 2019 budget and EUR 0.50 million from the 2020 budget

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<sup>117</sup> 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

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## **8. Subscription**

### **OA-SU-1: Annual subscription to the International Partnership for Energy Efficiency Cooperation (IPEEC)<sup>119</sup>**

The purpose of the International Partnership for Energy Efficiency Cooperation (IPEEC) is to strengthen international cooperation on energy efficiency. The action carried out under the auspices of the Partnership should result in more effective energy policy and programme output, in best practices being more widely known, disseminated and applied and in economies of scale. The aim of the Partnership is to offer a topic-driven, structured dialogue and an operational network for enhanced cooperation and exchanges on energy efficiency between countries and international organisations by:

- exchanging information and experience on development of regulatory measures, policies and programmes;
- developing benchmarks and sharing information on goods and services, along with measurement methods regarding energy performance and energy savings;
- strengthening information, education and training for energy consumers;
- building stakeholder capacity by improving contacts between national, regional and local authorities and other relevant partners and stakeholders, exchanging views and sharing knowledge and experience.

On 30 November 2009 the Council adopted a Decision on the signing and conclusion of the Terms of Reference for the IPEEC and the Memorandum concerning the hosting by the International Energy Agency of the Secretariat of the International Partnership for Energy Efficiency Cooperation by the European Community. The Council endorsed the Commission proposal that, from the second year of membership (i.e. 2012), the European Union will voluntarily contribute for each subsequent year.

Type of Action: Subscription

Indicative timetable: From 3rd quarter of 2018 onwards

Indicative budget: EUR 0.08 million from the 2018 budget, EUR 0.08 million from the 2019 budget and EUR 0.08 million from the 2020 budget

### ***OA-SU-2: Contribution to Implementing Agreements (IA) of the International Energy Agency (IEA)***

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

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<sup>119</sup> 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.

- Ocean Energy
- ISGAN (International Smart Grid Action Network)
- GHG derived from fossil fuels use
- Solar Power and Chemical Energy Systems
- Photovoltaic Power
- Test Solar Heating and Cooling
- More Efficient Coal Combustion Centre
- Wind
- Renewable Energy Technology Deployment
- Hydropower Technologies and Programmes
- Co-operative Programme on Gas and Oil Technologies

Type of Action: Subscription

Indicative timetable: as of 1st quarter 2018, as of 1st quarter 2019, and as of 1st quarter 2020

Indicative budget: EUR 0.45 million from the 2018 budget, EUR 0.45 million from the 2019 budget, and EUR 0.45 million from the 2020 budget

## **9. Expert contracts**

### ***OA-E-1: External expertise***

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 2018, 1st quarter 2019 and 1st quarter 2020

Indicative budget: EUR 0.XX million from the 2018 budget, EUR 0.XX million from the 2019 budget, and EUR 0.XX from the 2020 budget

### ***OA-E-2: Experts for policy relevant analyses and forward looking reflection***

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.

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 2018, 1st quarter 2019 and 1st quarter 2020

Indicative budget: EUR 0.1 million from the 2018 budget, EUR 0.1 million from the 2019 budget, and EUR 0.1 from the 2020 budget

## BUDGET OVERVIEW TABLE

	<b>2018 budget (EUR million)</b>	<b>2019 budget (EUR million)</b>	<b>2020 budget (EUR million)</b>
Call for proposals H2020-LC-SC3- 2018-2019-2020	562.5	573	562
Contribution to topics: <ul style="list-style-type: none"> <li>• DT-10-2018</li> <li>• ICT-16-2019-20</li> <li>• SU-DS04-2018-20</li> <li>• LEIT-ICT-X-2019</li> </ul>	tbc	tbc	tbc
Contribution to FTI pilot	13.7	13.7	13.7
Other Actions	58.01	96.68	113.73
<b>Total</b>	<b>634.21</b>	<b>683.38</b>	<b>689.43</b>