

# Horizon 2020

## Energy Topics

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

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

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

Applications for Innovation Actions (bringing the technology from TRL 5-6 to 6-7) are invited (please see part G of the General Annexes).

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

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

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

Type of Action: Innovation action

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

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

Specific Challenge: In spite of the improvements in recent years, water and cost-competitiveness remain a crucial barriers to the deployment of CSP plants especially in arid areas. The challenge is to drastically reduce water consumption as well as costs thereby contributing to achieving the SET-Plan targets for CSP<sup>68</sup>.

Scope: Projects shall demonstrate cost-effective technical solutions which significantly reduce or replace the water consumption of CSP plants. The demonstration shall take place in a region with very good solar resource values (Direct Normal Irradiation > 2000 kWh/m<sup>2</sup> year).

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

TRL 7 shall be achieved at the end of project activities (please see part G of the General Annexes).

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

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

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

Type of Action: Innovation action

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

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

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

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

TRL 7 shall be achieved at the end of project activities (please see part G of the General Annexes).

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

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

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

Type of Action: Innovation action

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

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

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

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

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

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

TRL 7 shall be achieved at the end of project activities (please see part G of the General Annexes).

Opening the project's test sites, pilot and demonstration facilities, or research infrastructures for practice oriented education, training or knowledge exchange is encouraged. Activities to engage and involve local communities in the innovation action, to further improve social acceptance are encouraged.

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

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

Type of Action: Innovation action

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

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

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

TRL 6 shall be achieved at the end of project activities (please see part G of the General Annexes).

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

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

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

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

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

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

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

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

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

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

TRL 7 shall be achieved at the end of the project (please see part G of the General Annexes).

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

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

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

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

Type of Action: Innovation action

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

**LCE-18-2017: EGS in different geological conditions**

Specific Challenge: Geothermal resources at medium-high temperature can produce at competitive costs electricity, heat or a combination of both. Routinely created enhanced geothermal systems (EGS) offer the opportunity to produce geothermal energy throughout

Europe, including in locations where natural reservoirs are not available. In order to increase the number of geothermal installations, enhanced geothermal systems (EGS) have to be demonstrated as cost-competitive whereby innovative solutions are needed to allow for applications in geologic systems with different characteristics and of different origin.

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

TRL 7 shall be achieved at the end of project activities (please see part G of the General Annexes).

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

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

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

Type of Action: Innovation action

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

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

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

The following sub-challenges should be addressed:

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

Scope: Proposals shall aim at moving technologies that reached already TRL 5-6 to TRL 6-7 (please see part G of the General Annexes) through industrial demonstration projects in line with the Implementation Plan of the EIBI<sup>69</sup>. Projects should target the most promising

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<sup>69</sup> <http://setis.ec.europa.eu/set-plan-implementation/european-industrial-initiatives-eiis/eii-implementation-plans>.



advanced liquid biofuel production pathways incorporating new or improved biochemical/thermochemical/chemical conversion together with upgrading technologies and valorisation of co-products that improve the economic viability of the fuel production.

Environment, economic and social issues<sup>70</sup> including health and safety should be considered in the whole life cycle and appropriately addressed. A methodology that permits robust and reliable assessment of the environmental (notably in terms of GHG performance), economic and social benefits with respect to current technologies should be included.

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

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

Proposals should address both sub-challenges described above, while the main effort in 2016 shall be in addressing sub-challenge a) and in 2017 sub-challenge b). Where synthesis gas or intermediate energy carriers are produced, their final use for production of advanced biofuels for transport must be demonstrated.

In particular, proposals shall address one of the following:

In 2016:

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

In 2017:

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

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

<sup>70</sup> For example, will this solution bring positive changes to our lives and society? Will it support socially inclusive growth? What are the positive and negative externalities? Will it boost the creation of jobs and economic opportunities; revitalise the economy?

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

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

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

Expected Impact: Demonstrating advanced biofuel technologies at large industrial scale reduces the technological risks and paves the way for subsequent first-of-a-kind industrial projects. For this purpose, the scale of the proposals should permit obtaining the data and experience required so that up-scaling to a first-of-a-kind, industrial project can be envisaged as a next step. Favourable energy and GHG balances are expected. The demonstrated industrial concepts should ensure the techno-economic feasibility of the entire value chain and have the potential for a significant social and economic impact, notably in terms of job creation, economic growth and safe and affordable energy supply.

Type of Action: Innovation action

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

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

Specific Challenge: Decarbonisation of the aviation transport sector and reducing its dependence on fossil fuel requires liquid biofuels even in the longer term. Accelerating the deployment of advanced biofuel technologies for use in aviation will allow competitive production of biojet fuels on commercial scale, increase their attractiveness and facilitate achievement of the EU Biofuel FlightPath<sup>71</sup> targets. Therefore, the specific challenge is to enable commercial production of sustainable and cost-competitive advanced biofuels aimed for use in the aviation sector. In particular, supporting the accomplishment of pre-commercial plant(s) for advanced biofuels for aviation based on sustainable biomass feedstock is essential.

Scope: Proposals shall aim at moving technologies that have already reached TRL 5-6 to TRL 6-7 (please see part G of the General Annexes) through novel industrial demonstration projects which support the innovative integration of production processes for advanced

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<sup>71</sup> [http://ec.europa.eu/energy/sites/ener/files/20110622\\_biofuels\\_flight\\_path\\_launch.pdf](http://ec.europa.eu/energy/sites/ener/files/20110622_biofuels_flight_path_launch.pdf)  
<http://ec.europa.eu/transport/modes/air/doc/flightpath2050.pdf>

biofuels for aviation into first-of-a-kind or existing industrial scale plants. Projects should target the most promising advanced aviation biofuel production pathways incorporating upgrading technologies and valorisation of co-products that improve the economic viability of the fuel production. The ultimate production target of aviation biofuel for the complete plant shall be in the range of several tens of thousand tonnes per year. The aviation biofuel must be fully compliant with international aviation fuel standards and therefore suitable for commercial flight operations. Where relevant, projects should also make use of existing infrastructures for transportation, logistics, and fuelling for performing commercial flights with the produced fuel. Relevant datasets shall be collected for these operations.

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

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

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

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

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

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

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