



EN

Horizon 2020

Work Programme 2018-2020

5.ii. Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing and Processing

Important notice on the Horizon 2020 Work Programme

This Work Programme covers 2018, 2019 and 2020. The parts that relate to 2019 and 2020 are provided at this stage on an indicative basis. Such Work Programme parts will be decided during 2018 and/or 2019.

(European Commission Decision C(2017)7124 of 27 October 2017)

Call - INDUSTRIAL SUSTAINABILITY

H2020-NMBP-ST-IND-2018-2020

The purpose of this call is to further strengthen the global leadership of Europe's industry in environmental sustainability, through a combination of mature and disruptive technologies. Success will be seen in making measurable contributions to identified sustainable development goals.

This call contributes to the focus area 'Connecting economic and environmental gains – the Circular Economy' through:

- new technologies for the process industries such as industrial symbiosis and adaptation to new feedstock and sources of energy; and
- radical advances in catalysis.

It also contributes to the focus area 'Building a low-carbon, climate resilient future' through:

- the development of new materials and new technologies for renewable energy and energy storage; and
- new technologies for energy-efficient buildings.

The choice of topics supporting energy innovation reflects the four strategic priorities in Accelerating Clean Energy Innovation¹⁸

- Strengthening EU leadership on renewables;
- Decarbonising the EU building stock by 2050: From nearly zero-energy buildings to energy-plus districts;
- Developing affordable and integrated energy storage solutions; and
- Electro-mobility.

The Research Fund for Coal and Steel Programme complements the Horizon 2020 Framework Programme in the sectors related to coal and steel industry.

Some topics under this call contribute to the objectives of the European Innovation Partnerships (EIPs) on Raw Materials and Water Efficiency.

Proposals for Research and Innovation Actions and Innovation Actions submitted under this call should include a business case and exploitation strategy, as outlined in the Introduction to the LEIT part of this Work Programme.

¹⁸ COM(2016) 763 final

3.1. SUSTAINABLE PROCESS INDUSTRY (SPIRE)

The process industry embraces cement, ceramics, chemicals, engineering, minerals and ores, non-ferrous metals, steel and water sectors. Together, these sectors form a key part of Europe's manufacturing base, representing 20% of European industry in terms of both employment and turnover. These sectors are also characterised by a high dependence on raw materials and energy in their production and processing technologies. With these becoming increasingly scarce, resource efficiency, including the use of renewable resources, is now a key factor driving the competitiveness and sustainability of the European process industry. Accordingly, the central objectives in relation to the process industry are to optimise industrial processing, reduce energy and resource consumption and minimise waste in order to deliver European added value by making significant contributions to the Circular Economy and to fighting climate change.

Where relevant, actions under SPIRE are expected to take into account the Industrial Emissions Directive and provide input to the relevant Best Available Techniques reference documents. Research targeting for instance greenhouse gas or energy use reduction should also consider reduction of other emissions such as NO_x and PM in order to avoid undesired side effects.

Topics under SPIRE will support the European industry towards improved integration of industrial operations leading to better valorisation of energy and material streams, sustainable raw materials and enhanced performance and efficiency of particularly high energy-intensive processes.

In line with the strategy for EU international cooperation in research and innovation (COM(2012)497), international cooperation may be particularly appropriate in some areas of the Sustainable Process Industry, in particular with Eastern Partnership countries (Ukraine, Moldova, Georgia, Armenia, Azerbaijan and Belarus).

CE-SPIRE-01-2020: Industrial symbiosis (IA)

Proposals are invited against the following topic(s):

CE-SPIRE-02-2018: Processing of material feedstock using non-conventional energy sources (IA)

Specific Challenge: Non-conventional energy sources, such as microwave, plasma, ultrasound and laser, as well as electrochemical and photochemical processes, have already been applied in process intensification, mainly at lab scale, showing significant improvements in process performance (e.g. improved selectivity, crystal nucleation, reaction speed easing raw material demand) for the benefit of energy efficiency. The processes powered by non-conventional energy sources are suitable for connection to the electricity grid. They allow variable throughputs to better follow market demand and enable leaner production paradigms (e.g. decreased stock, production on demand). Such technologies are suitable for downscaling and

continuous processing, where they can also be coupled with real time monitoring allowing a finer control of the transformations.

Scope: Proposals are expected to develop technologies applying non-conventional energy sources to processes of high industrial interest. The concepts proposed should:

- Show potential for integration in a renewable electricity grid, and consider the relevant limitations (fluctuating nature of the electricity stream);
- Provide significant advantages in terms of resource and energy efficiency, compared to the current state of the art processes (or similar ones, as relevant);
- Provide improved flexibility, working at variable throughputs without major losses in the overall process performance;
- Be applicable to continuous processes and/or show potential enabling the replacement of current batch ones;
- Consider, where relevant, the possibility for containerised and/or mobile (e.g. biomass in situ processing) technologies;
- Consider Life Cycle Assessment proving a reduced environmental footprint;
- Consider replicability and scalability of the proposed concepts.

Activities should start at TRL 4 and achieve TRL 6 at the end of the project.

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

Expected Impact:

- Allowing for a -30% to +30% energy input within RES fluctuations timeframes, without significant losses in specific energy efficiency;
- Improvement in energy efficiency of 30%;
- Improvement in resource efficiency of 30%;
- Decrease in CO₂ emissions by 40% (without considering the electricity generation and at steady state);
- Decreased OPEX and CAPEX by 15%;
- Effective dissemination of major innovation outcomes to the current and the next generation of employees of the SPIRE sectors, through the development of learning

resources with flexible usability. These should be ready to be easily integrated in existing curricula and modules for undergraduate level and lifelong learning programs.

Relevant indicators and metrics, with baseline values, should be clearly stated in the proposal.

Type of Action: Innovation action

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

CE-SPIRE-03-2018: Energy and resource flexibility in highly energy intensive industries (IA 50 %)

Specific Challenge: Energy intensive industries should adapt their production processes and unit operations to increasingly sustainable, but highly fluctuating energy supply. To this end, energy and resource flexibility in the European process industry can be improved through the development of novel processes utilising more efficiently energy streams, heat recovery and raw materials flows with variable properties (including new or modified materials as well as secondary raw materials and by-products).

The challenge is to establish synergistic integration at a regional level among different production sectors leading to optimisation of production system as a whole and logistics, especially in terms of the supply of energy and raw materials. This should reduce emissions and environmental impact, while maintaining competitiveness and job security.

Scope: Solutions are needed for value chain optimisation through energy efficiency considerations in the design phase of manufacturing equipment and processes, collective demand side strategies, and potential integration of the nearby renewable energy sources.

In particular, proposals are expected to develop:

- Innovative production technologies allowing flexibility in terms of raw material, including new, modified or secondary raw materials, and intermediate or final products are expected to be developed. They have, at the same time, to consider quality of the main products and by-products in view of their valorisation through re-use and recycle;
- Novel advanced energy systems, could include new combustion and gasification techniques applied to the highly resource and energy intensive industries have to be developed;
- New developments should clearly indicate how the use of sustainable electrical energy sources, or heat recovery, could enhance energy efficiency and cope with a fluctuating energy input. These actions have to bring a significant impact on the sustainability profile of the process and/or the final products.

Proposals need to consider the following elements:

- Treatment technologies and process integration solutions allowing a significant reduction as well as the valorisation, re-use and recycling of by-products and waste streams (solid, liquids and gaseous);
- System, process modelling and integration (up and down-stream) within the plant operation terms or symbiosis concepts, improving energy and raw materials efficiency and flexibility, and minimising the impact on the environment of the whole value chain. Taking also into consideration optimisation at a plant/system level. The activities have to be supported by a quantitative Life Cycle Assessment.

Proposals should include multiple demonstrators, including retrofitting of industrial installations, in a highly energy and resource intensive industry-relevant environment. The whole value chain should be considered, as well as relevant regulations which support the recycling of waste materials in Europe. Exploitation of structural and regional funds in connection with smart specialisation strategies is strongly encouraged.

Activities should start at TRL 5 and achieve TRL 7 at the end of the project.

The Commission considers that proposals requesting a contribution from the EU between EUR 8 and 12 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

As an exception from General Annex D, the funding rate for eligible costs in grants awarded under this topic will be differentiated: 100% of the eligible costs for beneficiaries and linked third parties that are non-profit legal entities; and 50% of the eligible costs for beneficiaries and linked third parties that are for profit legal entities.

Expected Impact:

- Cost reduction of the process of at least 10% through the implementation of a flexible scheme in raw materials, including secondary raw materials, process and product quality specifications;
- Improved process efficiency through re-utilisation of energy and/or material process streams by at least 15%;
- CO₂ emissions reduction by at least 5% and reduction of the environmental impact in terms of the main key performance indicators by at least 15%;
- Effective dissemination of major innovation outcomes to the current and next generation of employees, through the development, by education/training experts, of learning resources with flexible usability. These should be ready to be easily integrated in existing curricula and modules for undergraduate level and lifelong learning programmes.

Relevant indicators and metrics, with baseline values, should be clearly stated in the proposal.

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

CE-SPIRE-07-2020: Recovery of industrial water, thermal energy and substances contained therein (IA)

CE-SPIRE-08-2020: Improved Industrial Processing using novel high-temperature resistant materials (RIA)

CE-SPIRE-09-2020: Making the most of mineral waste, by-products and recycled material as feed for high volume production (IA)

CE-SPIRE-10-2018: Efficient recycling processes for plastic containing materials (IA)

Specific Challenge: Plastics materials are produced mainly from raw materials of fossil origin (e.g. PE, PP, and PET). A variety of bio-based plastic materials are increasingly available. Plastic materials are used in a wide range of applications because of their properties, versatility, lightweight and price, for example for making lightweight polymer composites to substitute metals and in more traditional applications, such as packaging. The wide use of these materials results in a huge amount of plastic waste. Recycling and redesign of plastics are essential in reusing plastic waste material and avoiding landfill. This also allows utilising plastics as carbon sinks in an optimal way, before using them for energy recovery at the end of life. A major challenge lies in the development of process technologies, utilising plastic waste as starting material (at least in part). A better use of underexploited resource (plastic waste) for the production of added value products (not restricted to plastics but excluding fuels) and process streams would support the circular economy.

Scope: Proposals submitted under this topic are expected to cover processes for the production of recyclable materials containing plastics. Aspects to be considered are:

- Improved energy and resource efficiency. The processes proposed are expected to have a lower environmental footprint compared to the current state of the art for the production of added value products; this should be proved by Life Cycle Assessment as well as Life Cycle Cost to prove the economic viability of the proposed technology;
- Integration with the relevant value chains, ensuring the secure supply of the raw material streams. In this respect, a clear strategy to involve the relevant actors along the value chain is expected;
- Process flexibility and ability to utilise waste heterogeneous plastic materials, including plastic composites, as input to allow the recycling and the re-processing of this widely available resource into added value products (excluding fuels). Sustainable raw materials, such as bio-based raw materials and organic waste could also be considered;
- Key issues related to the quality of the raw (including secondary) material streams should be covered, and in particular the heterogeneity of the waste plastic material, as well as the wide variety of substances contained in plastic materials (e.g. plasticisers,

anti-oxidants, etc.). The valorisation of fillers or fibres from composites should also be covered;

- Quality/specifications of the yielded streams ensuring their usability by downstream industries;
- Non-technological hurdles, such as regulations and standards, to enable the prompt deployment in industry of the developed concepts and economic indicators (e.g. CAPEX and OPEX).

Demonstration activities, prototypes and pilot implementations in real industrial settings for the concepts proposed are expected.

Proposals submitted under this topic should include actions designed to facilitate cooperation with other projects; to enhance user involvement; and to ensure the accessibility and reusability of data produced in the course of the project.

Activities should start at TRL 5 and achieve TRL 7 at the end of the project.

The Commission considers that proposals requesting a contribution from the EU between EUR 6 and 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:

- More efficient and sustainable chemical process and processing technologies utilising plastic waste as starting material for the production of added value products such as recyclable plastic materials (e.g. composites) and chemicals but excluding fuels;
- The technologies proposed should provide a decreased utilisation of primary fossil resources in the process industry of at least 30%;
- The concepts proposed should provide a decrease in CO₂ emissions of at least 20%;
- The concept should utilise at least 70% of waste material including at least 40% of plastic waste;
- Effective dissemination of major innovation outcomes to the current next generation of employees of the SPIRE sectors, through the development, by education/training experts, of learning resources with flexible usability. These should be ready to be easily integrated in existing curricula and modules for undergraduate level and lifelong learning programmes.

Relevant indicators and metrics, with baseline values, should be clearly stated in the proposal.

Type of Action: Innovation action