SPIRE (Sustainable Process Industry)

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Cross-Cutting Call: Competitive, Low Carbon and Circular Industries (Section 20. Cross-cutting activities)

- **Portfolio rationale**: Design and demonstration of
  - profitable and sustainable (circular) value chains of materials, products and services;
  - novel sourcing and value-added destinations for non-product outputs between industrial facilities (industrial symbiosis)

- **Portfolio approach**: clustering activities
  - continuous dialogue and exchange of good practices between all actors involved
  - transfer of knowledge and to identify technological and non-technological barriers.
  - coordinated deliverables and joint dissemination or exploitation activities
<table>
<thead>
<tr>
<th>NMBP</th>
<th>Budgets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. NMBP - ERA-NET on materials, supporting the circular economy and Sustainable-Development-Goals</td>
<td>118.5 M€</td>
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<tr>
<td>2. NMBP - Materials life cycle sustainability analysis (RIA)</td>
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<td>3. SPIRE - Tapping into the potential of Industrial Symbiosis (IA)</td>
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<td>4. SPIRE - Preserving fresh water: recycling industrial waters industry (IA)</td>
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<td>5. SPIRE - Alternative mineral resources for high volume production (IA)</td>
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<tr>
<th>SC5</th>
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<tbody>
<tr>
<td>6. Develop, implement and assess a circular economy oriented product information management system for complex products from cradle to cradle (IA)</td>
<td>58 M€</td>
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<tr>
<td>7. Raw materials innovation for the circular economy (IA): processing and refining of primary and/or secondary raw materials; recycling of raw materials from end-of-life products &amp; buildings; advanced sorting systems for high-performance recycling of complex end-of-life products, sustainable metallurgical processes</td>
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<tr>
<th>SC3</th>
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<tr>
<td>9. Low carbon industrial production using CCUS (IA)</td>
<td>29 M€</td>
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<tr>
<td>10. Industrial (Waste) Heat-to-Power conversion (IA)</td>
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<tr>
<td>Topics (Type of Action)</td>
<td>Budgets (EUR million)</td>
</tr>
<tr>
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<td>CE-NMBP-41-2020 (ERA-NET-Cofund)</td>
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<td>CE-NMBP-42-2020 (RIA)</td>
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<td>CE-SC5-08-2020 (CSA)</td>
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<td>CE-SPIRE-01-2020 (IA)</td>
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<td>CE-SPIRE-07-2020 (IA)</td>
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<td>LC-SC3-NZE-5-2020 (IA)</td>
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<td>Overall indicative budget</td>
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Specific Challenge:

Industrial Symbiosis holds significant potential to provide:

- Major improvements in resource and energy efficiency for all energy intensive industries.
- Accelerate the transition to a circular economy and to renewable energy systems, reduce waste heat energy and lead to significant reduction of GHG emissions.
- **Challenge: Industrial Symbiosis is currently not yet widely implemented.**
- Need to tackle technological and non-technological barriers to harness its full potential.
- Energy grids and adjacent infrastructures as well as the local and regional dimension are all critical factor which must be taken into account.
CE-SPIRE-01-2020: Tapping into the potential of Industrial Symbiosis

Scope:
Demonstrate novel symbiotic value chain involving multiple industrial sectors in real industrial settings.

Proposals are expected to address:

• Broader symbiosis with infrastructures communities and energy grids, including the role that IS can play in fluctuating energy grids.

• Management of side/waste streams specifically for the use as resource for other plants and companies across sectors and/or across value chains;

• Process (re-)design and implementation to integrate and adapt existing processes to enhance industrial symbiosis.

• Integration of information technology (e.g. AI) for multi-criteria decision making, the design and management of IS in a dynamic production environment. Considering data sharing and preservation of data confidentiality.
Scope:

• Assessment methodologies and KPIs to measure the performance of symbiosis, including environmental, economic and social impacts, LCA, LCC, LCSA taking into account existing sustainability standards (e.g. ISO 10410) and existing best practices;

• Consider Non-technological aspects (e.g. regulatory issues, standards, and new business models) covering ownership, management and fair sharing of benefits.

Clustering and cooperation with other selected projects under this cross-cutting call and other relevant projects is strongly encouraged.
CE-SPIRE-01-2020: Tapping into the potential of Industrial Symbiosis

**EUR (12-20 millions)**

**Expected Impact:**

• Step change towards closing circular loops;
• Improvement of at least 15% in energy efficiency of the targeted industrial processes, compared to the non-symbiotic scenario;
• Reduction of at least 30% in total energy intensity, on the basis of full life cycle considerations;
• Overall reductions in CO2 emissions of 40% compared to the non-symbiotic scenario;
• Reduction in primary raw material intensity of up to 20%;
• Reduction of waste generation by at least 25%;
• Better understanding of relevant barriers (e.g. end of waste criteria);
• The environmental gains in absolute figures, and weighted against EU and global environmental footprints, should be demonstrated;
• In addition, the replication potential should also be be assessed.
Specific Challenge:

• Energy-intensive industries are major users of fresh water, for e.g. processing, washing, diluting, heating, cooling, and transporting products.

• Since fresh water is a scare resource, breakthrough innovations are needed in energy-intensive industries to recycle water and create closed loops in industrial processes and reduce the use of fresh water.

• Industrial symbiosis offers the potential for energy, water and other resource efficiency at a scale beyond energy intensive industries.
Scope:

Proposals should aim at near-zero discharge using closed-loop systems in combination with recovery of energy and/or substances (resources) through the development of integrated water-smart strategies for industrial processes.

Strategies should take into account:

• Better characterization of water usage and production in the industrial processes.

• Defining recycling options with a combined water, waste and energy approach in an integrative system design method considering investment and optimal operations.

• Reduce water demand through design, control options, and technologies integration that reduce water consumption, recycle water, and reduce the use of fresh water (e.g. cascading use of different kinds of water in industrial settlements or for compatible re-use in urban and rural areas).
Scope:

• Proposals should develop new technologies and approaches at a large scale, considering:

• Real time smart monitoring and management systems with innovative digital solutions for sensors and actuators.

• Recovery technologies such as highly selective separation and extraction processes, and new solutions for water treatment to prevent fouling and corrosion.

• Integrated Water Management should consider different qualities and sources of water.

• Scale-up testing to robust industrial processes will be required.

• Clustering and cooperation with other selected projects under this cross-cutting call, and with other relevant projects, SC5-04-2019 “Building a water-smart economy and society”, is strongly encouraged.
CE-SPIRE-07-2020: Preserving fresh water: recycling industrial waters industry

**Expected Impact:**

- Significant reduction of the current use of fresh water resources.
- Significant steps towards near-zero discharge using closed-loop systems in industrial processes.
- Significant increase of the recovery of water, energy and/or substances and materials.
- Increase of resource and water efficiency by 30% compared to the state-of-the-art.
- The environmental gains in absolute figures, and weighted against EU and global environmental footprints, should be demonstrated.
- In addition, the replication potential should also be assessed.
- Relevant indicators and metrics, with baseline values, should be stated clearly in the proposal.
Specific Challenge:

- Energy intensive industries in Europe depend on the one hand on very large volumes of minerals and other raw materials (e.g. 70% of process manufacturing depends on minerals and metals). On the other hand, they heavily rely on imports from third countries (extraction in Europe covers only 29% of the demand). The environmental footprint of high-volume products is also too high.

- The challenge is to develop technologies for the uptake of secondary raw materials based on industrial symbiosis, waste collection, or water treatment systems, and leading to new value chains or even value loops (i.e. reusing waste, by-products and recycled materials repeatedly).

- Such new technologies should enable overcoming barriers such as low costs of primary raw materials or differences in taxes across countries and regions (e.g. landfilling taxes for primary and secondary raw materials).
Scope:

- Proposals should address the development of new high volume value loops and integrated supply chains through industrial processes enabling the cross-sectorial, symbiotic, use of mineral waste, by-products and end-of-life materials from other industry sectors. The secondary materials can be used either as raw material for the production process or can be introduced in a subsequent process step to an intermediate product where they become a constituent of the final product. Composition variability of wastes or by-products can be addressed either by purification processes prior to production, or within the production process.

- The following aspects should also be considered:
  - Product specifications compliance (e.g. durability, versatility, quality, traceability), clearly shown by involving relevant actors in the value chain.
  - Economic viability of the proposed processes together with potential new business concepts and simplified methodologies.
Scope:

- Regulatory aspects such as transport and use of secondary material in new products put on the market.
- Information guides should be provided before the end of the project. These should address elements covering the quality of information from product manufacturers, for the efficient use of secondary materials (beneficiation, quality concepts, test procedures, applications and training) and facilitate decision making.
- Proof of concept should be delivered at pilot or demo scale (excluding commercially usable prototypes) to demonstrate convincingly scalability towards industrial applications. Projects are encouraged to develop advanced modelling tools or to use them to build dedicated pilot installations.
- Clustering and cooperation with other selected projects under this cross-cutting call and other relevant projects is strongly encouraged.
Expected Impact:

• Reduction potential of at least 30% of primary raw material use per ton of main (high volume) final product;
• Reduction of waste generation by at least 25%;
• Significant energy savings and reductions in CO2 emissions (including through a higher share of renewable energy) in the overall production lines.
• Secure and sustainable provision of secondary resources at total cost lower than existing solutions.
• Contribution to new standards for the use of secondary materials for new products;
• The environmental gains in absolute figures, and weighted against EU and global environmental footprints, should be demonstrated;
• In addition, the replication potential should also be assessed.
Call: Industrial Sustainability  
*(Section 5ii. Nanotechnologies, Advances Materials, Biotechnology and Advanced Manufacturing and Processing)*

- **Goal:**
  - Further strengthen the global leadership of Europe’s industry in environmental sustainability, through a combination of mature and disruptive technologies

- **Focus areas:**
  - Connecting economic and environmental gains – the Circular Economy
  - Building a low-carbon, climate resilient future

- **Strategic priorities:**
  - Strengthening the 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
  - Electromobility

- **RFCS, Raw Materials EIP**
## Call deadlines:

<table>
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<tr>
<th>Topics (Type of Action)</th>
<th>Budgets (EUR million)</th>
<th>Deadlines</th>
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<tbody>
<tr>
<td>LC-NMBP-31-2020 (IA)</td>
<td>20.00</td>
<td>12 Dec 2019 (First Stage) 14 May 2020 (Second Stage)</td>
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<td>DT-SPIRE-11-2020 (CSA)</td>
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<td>05 Feb 2020</td>
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<td>LC-EEB-04-2020 (IA)</td>
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<td>LC-EEB-07-2020 (IA)</td>
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<td>LC-EEB-08-2020 (IA)</td>
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<td>LC-SPIRE-08-2020 (RIA)</td>
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<td>Overall indicative budget</td>
<td>105.60</td>
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LC-SPIRE-08-2020: Novel high performance materials and components (RIA)

Specific Challenge:

• Radical transformation of energy intensive industries
• Future LC technologies: fluctuating and extreme conditions (HT, corrosion, etc...), high-energy performance design
• At present: limitations in materials or components resulting degradation, corrosion, wear → reduced efficiency, shutdowns
• Develop new materials or combined components, overhaul their performance
Scope (1/2):

**Develop and test** high performance materials and combined components to withstand extreme and varying conditions, and improve their target performance for a long time.

- **Design** highly innovative materials with improved properties (e.g., temperature and humidity resistance (corrosion, oxidation, thermal insulation), strength, functionality, weight, etc. and **components** with graded and protective coatings, yield strength, hardness, and resistance to media relevant for specific industrial application;

- **Components embedded with sensors** aiming at minimising industrial processing conditions constraints;
LC-SPIRE-08-2020: Novel high performance materials and components (RIA)

**Scope (2/2):**

- Significant *increase in lifetime of equipment* by reducing damage and degradation

- *Reduction of environmental impacts* in terms of waste management and energy and resource consumption.

**Other:**

- Business case and exploitation strategy (LEIT introduction)

- **TRL 3 → 5**

- **EU contribution ~ 4-6 million EUR**
Expected impact:

At least two out of following three impacts:

• Energy efficiency improvement of the target production and/or operation processes of at least 30%;

• Reduction of CO2 emissions and resource utilisation by 20%;

• Increased lifetime of the equipment by at least 20%.

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

• Digitisation of Process Industries

• Connected devices, sensors and actuators (internet of things) to identify and optimise solutions, make complex decisions

• Vast amount of unexploited data $\rightarrow$ Artificial intelligence (AI) key enabling technology (wider potential than suggested by industrial applications)
Scope 1/2:

• Identification and mapping of digital technologies, level of penetration, most relevant specific AI- and big data technologies, and most relevant application cases and/or pilots in process industry.

• Roadmap for all sectors in the process industries with clear recommendations for researchers, managers, and operators.
Scope 2/2:

- Research and innovation management, planning, and design (e.g. new chemical synthesis strategies, health and safety assessments);
- Process control: yield and accuracy enhancement;
- Supply chain management and scheduling of connected processes, plants and/or sites (e.g. for industrial symbiosis), process flexibility;
- Predictive maintenance;
- Product customisation and product traceability.
Expected Impact:

- Better exploitation of AI in the process industries;
- Identification of existing and future data requirements for the development of data driven technologies;
- Seamless collaboration of human operators with process control systems and plants;
- Implementation and elaboration of the SRI agenda (EC Com on Artificial Intelligence)
Specific Challenge:
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• Need to tackle technological and non-technological barriers to harness its full potential.
• Energy grids and adjacent infrastructures as well as the local and regional dimension are all critical factors which must be taken into account.
Thank you!

#H2020Energy

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Eleftherios BOURDAKIS
Policy Officer
DG RTD – Directorate Prosperity
F.3 Sustainable Industry System
EeB Topics 2020

Budget: 52.5 M€
Deadline: 05 February 2020

• LC–EEB–04–2020 - Industrialisation of building envelop kits for the renovation / market (IA)

• LC–EEB-07-2020 – Smart Operation of Proactive Residential Buildings (IA)

• LC–EEB–08–2020 – Digital Building Twins (RIA)
Topic LC-EEB-04-2020: Industrialization of building envelope kits for the renovation market (IA)

Specific Challenge:

• Despite the wide range of products dedicated to insulation, energy supply and comfort available on the market, affordable, ready-to-go, all-in-one, tailor made reliable solutions directed to deep renovation of existing residential buildings are missing.

• Research and Innovations is necessary for all-inclusive envelope industrialised solutions addressing deep renovation of buildings that are sufficiently flexible and customisable to address significant market segments in EU reaching Near Zero-Energy Building (NZEB) standards.
Scope: Proposals should include at least the following elements

- Develop plug & build smart components and modules with the specific connecting and controlling parts
- Decision support tools for the selection of the refurbishment solution based on LCA/LCC
- Adaptable and scalable Building Management Systems (BMS)
- Case modelling applications, analysis prior to installations, guide for installers and support for decommissioning
- Solid plan for industrial uptake at a large scale, meeting eco-construction and eco-production standards
- Retrofit the whole envelope of two to three real scale residential buildings in different climate zones plus at least three virtual demos of the plug & play elements

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Expected impact:

• Demonstrate retrofitting plug & build solutions and tools reaching NZEB standards suitable for mass production by industry for buildings under deep renovation;
• Decrease of retrofitting time and costs by at least 50% compared to current renovation process for the same building type;
• Improve Life Cycle Assessment (LCA) standards;
• Accelerate the renovation process by enabling access to better products.

TRL: 5-7
Type of Action: Innovation Action
Budget: 6-8M €

#H2020Energy
Topic LC-EEB-07-2020: Smart Operation of Proactive Residential Buildings (IA)

Specific Challenge:

• Challenges in building energy management and demand for a new solution;
• Smart operation of proactive buildings based on innovative components, accurate energy performance predictions, control technologies, predictive maintenance and data supply for the customer;
• Future energy management and contracting turning a building from reactivity into proactivity. A building should be able to control a situation rather than just responding to it;
• Buildings should act in advance and ensure interoperability between grid components and Building Energy Management Systems;
• Customer experiences should be simple, smooth and delightful.
Scope: Proposals should include at least the following elements

• Develop, test and promote the necessary technologies, devices and systems for a smart approach of energy management in line with the latest reforms of the EPBD;
• Develop solutions for proactive buildings, which should be safe, healthy (strengthening of the indoor environment quality requirements) and energy-efficient;
• Develop solutions to provide the pivotal parameters to be measured and controlled for integrated and demand-based control of the building service system. Self-management, self-monitoring, self-healing and self-optimisation will be required;
• Utilise a systematic, standardised approach to process the data generated by the sensors, forecasting services and end-users;
• Tackle utilisation of big data by advanced data visualisation to optimise the operation of the building;
• Ensure that fully integrated systems have the capacity to be compact, easy to commission and to operate, exchangeable and easy to interact with the grid;
• Implement and demonstrate new business models providing services that enable buildings to be proactive.
Expected impact:

- Maintenance cost reductions of at least 20%;
- Significant decrease of energy use in buildings through application of technologies such as dynamic models, big data analytics, predictive analytics and ultimately artificial intelligence;
- Improved indoor environment quality and user satisfaction;
- High replication potential;
- Optimise the use of renewable energy resources used in buildings;
- Contribution to standards, namely the establishment of a Smart Readiness Indicator.

**TRL:** 5-7  
**Type of Action:** Innovation Action  
**Budget:** 6-8M €
Topic LC-EEB-08-2020: Digital Building Twins (RIA)

Specific Challenge:

• Go beyond the data provided through BIM

• Facilitate monitoring of activities and comparison of relevant data against the initially agreed planning

• Answer to the lack of open semantic interoperability standards between actual BIM and future BIM
Scope: Proposals should include at least the following elements

- Automated progress monitoring allowing to verify that the completed work is consistent with plans and specifications;
- Tracking of daily changes in an as-build model, allowing early detection of discrepancies;
- Avoiding over-allocation of resources by dynamic prediction of requirements, thus reducing the need to move resources over long distances and improving time management;
- Assurance of the safety of workers through a system of early detection and notification by applying artificial intelligence;
- Quality assessment by image processing technologies should allow verification of structure conditions and detection of cracks or material displacement, triggering additional inspections;
- Optimisation of equipment usage by advanced imaging and automatic tracking.
Expected impact:

- Better scheduling forecast by 20%;
- Proposals for a future standardisation for Digital Twins at a European scale;
- Better allocation of resources and optimization of equipment usage;
- Reduced number of accidents on construction sites;
- Reduction of costs on constructions projects by 20%.

**TRL:** 4-6  
**Type of Action:** Research & Innovation Action  
**Budget:** 5-6M €
Topic NMBP-36-2020: Monitoring and safety of transport infrastructures (CSA)

Specific Challenge:

- Too many collapses of aging road bridges in Europe (built more than 40 to 50 years ago)
- Need of sound procedures to ensure efficient monitoring, quality control and preventive maintenance of construction activities (including materials)
- Bridges are in particular sensitive infrastructures subject to volumes of traffic greater than originally designed for. Including Ten-T!
- Action proposed to analyse relevant procedures and examine new technologies for optimising monitoring/ control of bridges
- Identify concrete needs for an harmonized approach, including where possible for other infrastructures (e.g. tunnels)
Scope: Proposals should include at least the following elements

• Critical review of existing procedures across EU
• Analysis of advanced technologies, procedures, methodologies and standards to monitor and control safety and smooth operation of aging bridges
• State of the art for damage detection technologies and methods for assessment of performances
• Barriers (technical, economic, environmental, social, administrative), which hinder the safe operation/ maintenance of bridges
• Identify efficient ways to reflect deviations from design specs in maintenance programmes (more frequent use, higher loads, climate change, extended life)
• A roadmap for adoption of technologies to measure predicted durability of materials, components and overall reliability of existing assets
• The technical input for a future EU standard and guidance material
• Develop networks with relevant stakeholders (e.g. authorities, industry, academia, etc.) to share the findings of this CSA
Expected impact:

• Support the preparation of a mandate for a standard (CEN TC 250) for the maintenance and control of large infrastructures.

• Best practices for monitoring the safety of bridges and other relevant infrastructures

• Significant improvement of the safety of bridges and other relevant transport infrastructure through improved maintenance and control

**Type of Action:** Coordination and Support Action (CSA)

**Budget:** 2M €
Thank you!

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