PHOTONICS 21

# WORK PROGRAMME 2014-2015

## SPECIFIC PROGRAMME IMPLEMENTING HORIZON 2020

**SELECTION OF TOPICS FROM WORK PROGRAMME 2014-2015**

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# WORK PROGRAMME 2014-2015

## SPECIFIC PROGRAMME IMPLEMENTING HORIZON 2020

## SC1 - Health, demographic change and wellbeing

## PHC10 – 2014: Development of new diagnostic tools and technologies: *in vitro* devices, assays and platforms

### Specific challenge:

The development of new diagnostics (more sensitive, robust and selective) for improved clinical practice demands the translation of multidisciplinary scientific and technological knowledge from diverse fields into clinical applications. Innovation in this area relies on the development, translation and uptake of existing, new or evolving and often complex technologies.

Improved clinical decisions based on new and improved diagnostic tools and techniques should lead to better health outcomes while contributing to the sustainability of the health care system.

This is also a field where many small European companies are active.

### Scope:

Proposals should focus on the development and application of novel in vitro diagnostic tools and technologies (including assays and platforms). The novel application of existing tools and technologies is not included. These tools and technologies should improve the performance of diagnosis, prediction, monitoring, intervention or assessment of therapeutic response, with a significant impact on clinical decisions and health outcomes.

Additionally, proposals may include approaches based on high-throughput screening, nanotechnologies or microfluidics, data analysis methodology, or technologies for point-of-care diagnostics.

The Commission considers that proposals requesting a contribution from the EU of between EUR 4 and 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:

This should provide:

- Innovative, more accurate, more reliable and cost effective *in vitro* diagnostic tools and technologies for earlier disease diagnosis, patient stratification and/or prognosis of disease outcome leading to improved clinical decisions and health outcomes.
- Contribution to the sustainability of health care systems.
- Growth of the European diagnostics sector, in particular for SMEs.

### Type of action:

Research and innovation actions

## PHC 11 – 2015: Development of new diagnostic tools and technologies: in vivo medical imaging technologies

### Specific challenge:

The development of new diagnostics (more sensitive, robust and selective) for improved clinical practice demands the translation of multidisciplinary scientific and technological knowledge from diverse fields into clinical applications. Innovation in this area relies on the development, translation and uptake of existing, new or evolving, and often complex technologies.

Improved clinical decisions based on new and improved diagnostic tools and techniques should lead to better health outcomes while contributing to the sustainability of the health care system.

This is also a field where many small European companies are active.

### Scope:

Proposals should focus on the development of innovative in vivo imaging tools and technologies. The novel application of existing tools and technologies is not included. Tools and technology should aim at improving diagnosis, prediction, monitoring, image-based intervention or assessment of therapeutic response, with a significant impact on clinical decisions and health outcomes. Proposals should focus on innovations that offer a clear advantage over existing tools and technologies. Development of in vivo medical imaging technologies should make use of existing high-tech engineering or physics solutions or innovative ideas and concepts coming from those fields and if appropriate, new developments in the field of imaging agents.

The Commission considers that proposals requesting a contribution from the EU of between EUR 4 and 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:

This should provide:

- New in vivo diagnostic tools and methods providing more accurate, less invasive, more reliable and earlier disease diagnosis, prediction or response to therapy, leading to improved clinical decisions and outcomes.
- Contribution to the sustainability of health care systems.
- Growth of the European diagnostics sector, in particular for SMEs.

### Type of action:

Research and innovation actions

## PHC 12 – 2014/2015: Clinical research for the validation of biomarkers and/or diagnostic medical devices

**Specific challenge**:

Biomarkers are used in clinical practice to describe both normal and pathological conditions. They can also have a prognostic or a predictive power. They are therefore increasingly used in medicine and many potential biomarkers are proposed every year.

Only a few of them are however validated for use in a clinical research setting. Such validation implies the demonstration of a link to a pertinent clinical endpoint or process, as well as a robust and appropriate analytical method.

The clinical validation of biomarkers will be increasingly important for the development of new diagnostics, and this is a research area where many small European companies are active.

Improved clinical decisions should lead to better health outcomes while contributing to the sustainability of the health care system.

**Scope:**

The SME instrument consists of three separate phases and a coaching and mentoring service for beneficiaries. Participants may apply to phase 1 with a view to applying to phase 2 at a later date, or directly to phase 2.

Proposals submitted to phase 1 shall consist of a draft business plan and feasibility study verifying the technological/practical and economic viability of the clinical validation proposed. These may, for example, comprise risk assessment, market study, user involvement, intellectual property (IP) management, innovation strategy development, partner search, feasibility of concept etc. Proposals may analyse bottlenecks preventing advance of the applicant SME in this area and identify how a phase 2 proposal may contribute to attaining growth or sustainability.

The main outcome of the proposal should be a detailed business plan. Funding for phase 1 will be provided in the form of a lump sum of EUR 50.000 and proposals should have a duration of around 6 months.

In phase 2 proposals should address the specific challenge described, elaborated in the scope section above, and demonstrate high potential in terms of applicant's competitiveness and growth underpinned by a strategic business plan.

Proposals shall be based on a business plan developed either through phase 1 or another means. Particular attention must be paid to IP protection and ownership; applicants should provide evidence of the possibility of commercial exploitation (‘freedom to operate’).

The clinical validation of existing potential biomarkers (not the identification of new ones) is sought. This validation should provide evidence for: high analytical validity; appropriate sensitivity and specificity; clinical validity/ utility. Preference will be given to validation of biomarkers with high potential for short term uptake into clinical practice.

In addition, validation of the clinical performance of new diagnostic devices can be supported, either in combination with the biomarker validation, or against existing standards.

Both in vivo and in vitro potential biomarkers are eligible. Preference will be given to the validation of disease related biomarkers (i.e. diagnostic, susceptibility/risk, monitoring and prognostic biomarkers)

Proposals shall contain a specification for the outcome of the project, including a first commercialisation plan, and criteria for success.

The Commission considers that phase 2 proposals requesting a contribution from the EU of between EUR 1 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. Phase two projects should duly justify their duration making reference to obtaining patient samples, ensuring patient follow up, etc.

In addition, in phase 3, SMEs can benefit from indirect support measures and services as well as access to the financial facilities supported under Access to Risk Finance of this work programme.

Successful beneficiaries will be offered coaching and mentoring support during phase 1 and phase 2. This service will be accessible via the Enterprise Europe Network (EEN) and provided by a dedicated coach through consultation to the beneficiaries. The coaches will be recruited from a database managed by the Commission and on the basis of their business experience and competencies. Throughout the three phases of the instrument, the EEN will complement coaching support by providing access to its innovation and internationalisation services. This may include, for example, depending on the needs of the SME, support in identifying growth potential, developing a growth plan and maximising it through internationalisation; strengthening the leadership and management skills of individuals in the senior management team and developing in-house coaching capacity; developing a marketing strategy or raising external finance. Expected impact:

This should provide:

- Increased clinical availability and exploitation of biomarkers for the benefit of the patient.
- New diagnostic devices.
- Facilitation of entry of improved diagnostics in the clinic and the market.
- Support for the implementation of the Commission proposal for a revised in vitro diagnostic devices regulation[10].
- Enhancing profitability and growth performance of SMEs by combining and transferring new and existing knowledge into innovative, disruptive and competitive solutions seizing European and global business opportunities.
- Contribution to the sustainability of health care systems.
- Increased likelihood of market uptake and distribution of resulting innovations tackling the abovementioned specific challenge(s) in a sustainable way.
- Leveraging of private investment in clinical validation as described above, notably leverage of private co-investor and/or follow-up investments.

**Type of action:**

SME instrument (100% funding)

While all other instances of the use of the SME instrument in Horizon 2020 provide for reimbursement at 70%, the predominance of research type activities in clinical validation necessitate reimbursement at 100% in this case.

## PHC 21 – 2015: Advancing active and healthy ageing with ICT: Early risk detection and intervention

### Specific challenge:

Citizens in an ageing European population are at greater risk of cognitive impairment, frailty and social exclusion with considerable negative consequences for their quality of life, that of those who care for them, and for the sustainability of health and care systems.

The earlier detection of risks associated with ageing, using ICT approaches, can enable earlier intervention to ameliorate their negative consequences.

### Scope:

Proposals should focus on early risk detection and intervention: specifically ICT based solutions which support active and healthy ageing by enabling early detection and minimisation of risks associated with ageing, including (but not limited to) cognitive impairment, frailty, depression and falls.

Proposals should demonstrate the link between changes in behaviour and subsequent negative consequences of ageing by unobtrusive behavioural sensing, and large scale collection of data readily available in the daily living environment of older individuals.

Proposals should also design ICT based interventions countering identified risks, as well as innovative treatments and therapies based on early detection.

Proposals should build on multi-disciplinary research involving behavioural, sociological, health and other relevant disciplines, and on stakeholder engagement in order to be driven by relevant user needs to ensure end-user acceptance (including gender aspects). Full account should be taken of relevant data protection aspects.

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:

- Evidence for the benefits of risk detection and intervention, based on proof of concept and involvement of relevant stakeholders
- Clear improvements of outcomes for individuals, care systems and wider society from new therapies and interventions based on early risk detection in comparison with current practices.
- Global leadership in ICT based innovation for active and healthy ageing.

### Type of action:

Research and innovation actions

## PHC 26 – 2014: Self-management of health and disease: citizen engagement and mHealth

### Specific challenge:

Empowering citizens to manage their own health and disease will result in more cost-effective healthcare systems by improving utilisation of healthcare, enabling the management of chronic diseases outside institutions, improving health outcomes, and by encouraging healthy citizens to remain so.

Several clinical situations would be prevented or better monitored and managed with the participation of the patient him or herself. Care sciences may complement the medical perspective without increasing the cost. This requires research into socio-economic and environmental factors, dietary impact and cultural values, behavioural and social models, attitudes and aspirations in relation to personalised health technologies, mobile and/or portable and other new tools, co-operative ICTs, new diagnostics, sensors and devices (including software) for monitoring and personalised services and interventions which promote a healthy lifestyle, wellbeing, mental health, prevention and self-care, improved citizen/healthcare professional interaction and personalised programmes for disease management. Support for knowledge infrastructures is also required, as well as the combination of predictive personalised models with personal health systems and other sources of data.

### Scope:

Proposals may focus on patients or healthy persons. Health management will be addressed in a holistic approach, from healthy lifestyle, dietary habits interlinked with disease management, placing the patient in the centre and putting increased emphasis on health education, secondary prevention and self-management of individual conditions, including comorbidities. Implementation of programs or applications for different target populations to capture gender- and age-dependent differences in health, behaviour and handling of devices is encouraged.

Proposals are invited which address this specific challenge by focusing on one of the two elements below:

(i) citizen engagement in health, wellbeing and prevention of diseases.

Projects shall enable individuals to become co-managers of their health and wellbeing(including physical and mental wellbeing, equality, health literacy, life style factors such as nutrition and smoking) with the help of ICT, tools and personalised services. The focus is on the following elements:

- The creation of a supportive environment for healthy behaviour including support to behavioural change e.g., mathematical, dynamic modelling of behaviour with quantitative, testable models especially in real world settings and application of the sciences in designing interventions or game based physical training with motion tracking based feedback;
- Health promotion, health literacy and disease prevention;
- The development of a multi-stakeholder ecosystem (of health and care professionals, patients, nutrition - and pharmaceutical industries, public healthcare authorities, health IT, mHealth actors, health insurers and regulators, etc…) to develop a 'co-production of health' business model – an evidence based, general, alternative way of creating and augmenting personalised health, supported by information exchange and utilisation and;
- A migration path towards comprehensive solutions that could be incorporated into health care processes.
- (ii) mHealth applications for disease management

Proposals should focus their research on application development for disease management with the following characteristics:

- Strong emphasis on co-designing and user needs as a key driver;
- Knowledge management systems to analyse and compile the data collected by applications on individuals' health and activities in order for such information to be used by the persons themselves, health professionals and public health monitoring authorities;

- Guidance for patients, care-givers, families and patients' social environment on chronic disease management supported by mHealth;
- Patient adherence to and compliance with medical recommendations
- Economic aspects of encouraging secondary prevention and addressing avoidable negative health and wellbeing outcomes;
- Screening for pre-frailty states
- Public health or health promotion interventions addressed to large sectors of population through mHealth applications and;
- Co-operative ICTs to support co-operative management of health and disease among patients and eco-health systems.

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

**Expected impact**:

In both cases (i) and (ii)

- Improved self-management of health, disease prevention, management of diseases and/or expenditure.
- Strengthened evidence base on health outcomes, quality of life, care efficiency gains and economic benefits from the use of ICT in new care models, in compliance with data protection requirements.
- Increased confidence in decision support systems for wellbeing and disease / patient management.
- Strengthened evidence and improved knowledge about individuals' behavior related to wellbeing, disease prevention or management facilitating the creation of new personalised behavioural health interventions.

For (i)

- Validated programmes for health promotion and disease prevention
- Ecosystem and new business models for promotion and co-production of health

For (ii)

- Improved service offering and business concepts and models
- Impact in several of the following facets of mHealth e.g., patient safety, contribution to or revision of (guidelines of) relevant legal frameworks, medical guidelines, harmonisation (across borders), standards, co-ordination of therapies, recognition of mHealth as a reimbursable cost, improved accessibility, liability, inter-operability, more reliable connectivity, patient empowerment, improved patient-health professional interaction, maturing personalised health systems, sustainability, usability and user-acceptance.
- Improved interaction between patients, their relatives and care givers, facilitating more active participation of patients and relatives in care processes.
- Improving the management of disease by reducing the number of severe episodes and complications.
- Increased level of education and acceptance by patients and care givers of ICT solutions for personalised care.

**Type of action:** Research and innovation action

# WORK PROGRAMME 2014-2015

## SPECIFIC PROGRAMME IMPLEMENTING HORIZON 2020

## SC2 -Food security, sustainable agriculture, marine and maritime research and the bio-economy

# Call for Sustainable Food Security - Sustainable food production systems

## SFS-8-2014/2015: Resource-efficient eco-innovative food production and processing

### Specific Challenge:

To remain competitive, limit environmental degradation and optimise the efficient use of resources, the development of more resource-efficient and sustainable food production and processing, throughout the food system, at all scales of business, in a competitive and innovative way is required. Current food production and processing systems, especially in the SME sector, need to be revised and optimised with the aim of achieving a significant reduction in water and energy use, greenhouse gas emissions and waste generation, while at the same time improving the efficiency in the use of raw materials, increasing climate resilience and ensuring or improving shelf life, food safety and quality. New competitive eco-innovative processes should be developed, within the framework of a transition towards a more resource-efficient, sustainable circular economy.

### Scope:

The SME instrument consists of three separate phases and a coaching and mentoring service for beneficiaries. Participants can apply to phase 1 with a view to applying to phase 2 at a later date, or directly to phase 2.

**In phase 1,** a feasibility study shall be developed verifying the technological/practical as well as economic viability of an innovation idea/concept with considerable novelty to the industry sector in which it is presented (new products, processes, design, services and technologies or new market applications of existing technologies). The activities could, for example, comprise risk assessment, market study, user involvement, Intellectual Property (IP) management, innovation strategy development, partner search, feasibility of concept and the like to establish a solid high-potential innovation project aligned to the enterprise strategy and with a European dimension. Bottlenecks in the ability to increase profitability of the enterprise through innovation shall be detected and analysed during phase 1 and addressed during phase 2 to increase the return in investment in innovation activities. The proposal should contain an initial business plan based on the proposed idea/concept.

The proposal should give the specifications of the elaborated business plan, which is to be the outcome of the project and the criteria for success.

Funding will be provided in the form of a lump sum of EUR 50,000. Projects should last around 6 months.

**In phase 2,** innovation projects will be supported that address the specific challenge of Sustainable Food Security and that demonstrate high potential in terms of company competitiveness and growth underpinned by a strategic business plan. Activities should focus on innovation activities such as demonstration, testing, prototyping, piloting, scaling-up, miniaturisation, design, market replication and the like aiming to bring an innovation idea (product, process, service etc.) to industrial readiness and maturity for market introduction, but may also include some research. For technological innovation a Technology Readiness Levels of 6 or above (or similar for non-technological innovations) are envisaged; please see part G of the General Annexes.

Proposals shall be based on an elaborated business plan either developed through phase 1 or another means. Particular attention must be paid to IP protection and ownership; applicants will have to present convincing measures to ensure the possibility of commercial exploitation ('freedom to operate').

Proposals shall contain a specification for the outcome of the project, including a first commercialisation plan, and criteria for success.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 2.5 million would allow phase 2 to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Projects should last between 12 and 24 months.

In addition, in phase 3, SMEs can benefit from indirect support measures and services as well as access to the financial facilities supported under Access to Risk Finance of this work programme.

Successful beneficiaries will be offered coaching and mentoring support during phase 1 and phase 2. This service will be accessible via the Enterprise Europe Network and delivered by a dedicated coach through consultation and signposting to the beneficiaries. The coaches will be recruited from a central database managed by the Commission and have all fulfilled stringent criteria with regards to business experience and competencies. Throughout the three phases of the instrument, the Network will complement the coaching support by providing access to its innovation and internationalisation service offering. This could include, for example, depending on the need of the SME, support in identifying growth potential, developing a growth plan and maximising it through internationalisation; strengthening the leadership and management skills of individuals in the senior management team and developing in-house coaching capacity; developing a marketing strategy or raising external finance.

Expected impact:

- Enhancing profitability and growth performance of SMEs by combining and transferring new and existing knowledge into innovative, disruptive and competitive solutions seizing European and global business opportunities.
- Market uptake and distribution of innovations tackling the specific challenge of Sustainable Food Security in a sustainable way.
- Increase of private investment in innovation, notably leverage of private co-investor and/or follow-up investments.
- The expected impact should be clearly described in qualitative and quantitative terms (e.g. on turnover, employment, market seize, IP management, sales, return on investment and profit).

**Type of action:**

SME Instrument (70%)

## SFS-10-2014/2015: Tackling disease related challenges and threats faced by European farmed aquatic animals

**Specific challenge**:

Disease prevention and management are essential for the sustainability of the European aquaculture industry. The diversity of species and farming practices throughout Europe involves also a significant number of threats related to a large variety of pathogens that hamper production and require specific preventive and curative practices and tools ensuring a high level of biosecurity of aquaculture production and related seafood products. Among other disease-related threats, parasites and related infections can cause significant damages on farmed fish species and can result in poor growth performance, impaired welfare and death of farmed animals with significant consequences in terms of production and economic performance. Parasites can also affect the end users of aquaculture products and therefore their monitoring and eradication are essential for ensuring the safety of European consumers. The management of diseases is even more challenging in farmed aquatic mollusc where the absence of adaptive immune system further complicates the development of tools and methods allowing mitigating effects of diseases on production. Despite the initiatives that have been implemented to understand, explain and mitigate disease outbreaks affecting farmed molluscs, which seem to have multifactorial origins, the future of the European mollusc production sector is still challenged.

**Scope:**

Proposals should address one of the following issues (A) or (B), and should clearly indicate to which one they refer:

**A. [2014] Scientific basis and tools for preventing and mitigating parasitic diseases of European farmed fish**

Proposals should focus on parasites with documented socio-economic impact on European finfish aquaculture production and on trade of products thereof. The main focus should be on the development of reliable, cost-efficient detection and diagnostic tools, as well as, preventive and curative practices, tools, medicines and treatments (adapted to relevant life stages and husbandry practices of related fish species) against (endo- and ecto-) parasites and related infections, for conventional and organic aquaculture. Proposals should also take into consideration parasitic transfer between wild and reared fish species and its mitigation. Finally, they should avoid any duplication with relevant other related research initiatives.

**B. [2015] Scientific basis and tools for preventing and mitigating farmed mollusc diseases**

Proposals should consider pathogens with documented impact on the production of the main farmed species of mollusc in Europe (oysters, mussels, clams and scallops). They should focus on minimising transmission and impact of disease, while addressing risk assessment and management of infected farmed molluscs. They should also consolidate the basis for genetic selection of mollusc strains resistant to the most relevant pathogens. Particular focus should be put on oyster pathogens and diseases, with emphasis on Oyster Herpes virus (OsHV-1), in order to better understand genetic diversity, pathogens spread, pathogenicity and key drivers of emergence and/or absence of disease outbreaks in relevant parts of the world. In line with the objectives of the EU strategy for international cooperation in research and innovation and in particular with the implementation of the International KBBE Forum priorities, should aim at developing an international network on oyster diseases and mortalities, between Australia, New Zealand, Canada, USA, Japan, S. Korea and EU33.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 7 million for (A) and EUR 4 million for (B) 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 should show that proposed projects contribute to some or all of the following:

- Generation of scientific knowledge on fish parasites and mollusc pathogens, their life-cycles/stages and their interactions with hosts of commercial interest.
- Availability of solutions to minimise risks and transmission of fish and mollusc diseases.
- Prevention and mitigation of diseases that impede the development of the European aquaculture sector and for which efficient solutions are currently lacking.
- Reliable, cost-efficient detection and diagnostic tools, as well as, preventive and curative practices, tools, medicines and treatments against parasites and related infections.
- Scientific evidence on the potential interactions between farmed and wild populations in terms of epidemiology of parasitic infections.
- Enhanced risk analysis and infected stock management. Improved productivity, economic performance and image of European aquaculture through improved biosecurity, health and welfare of farmed fish and mollusc.
- Compliance with existing legal framework related to authorized treatments for aquaculture production and to seafood trade. Improved traceability and safety of European and imported seafood products.
- Set-up of an international network on oyster diseases, including the main oyster producing countries and allowing the exchange of best practices in terms of surveillance, epidemiology, diagnostics, husbandry and selection of resistant oyster strains.

**Type of action:**

Research and innovation actions

## SFS-11-2014/2015: Implementation of an Ecosystem-based approach for European aquaculture

**Specific challenge:**

Access to space and high quality water are essential for European aquaculture operators. In particular, the lack of spatial planning is considered as one of the factors hindering the expansion of European aquaculture. Therefore, establishment of reliable (inland, coastal and offshore) spatial plans should be crucial for facilitating investment and development of the sector. Aquaculture also needs a high quality aquatic environment for ensuring the production of safe and nutritious seafood products. Subsequently, human activities, including operations of some specific aquaculture segments, that might affect negatively (e.g. through the impact of chemical, antibiotics, organic wastes, etc.) fresh water and marine ecosystems might also compromise the sustainability of European aquaculture. Therefore, ensuring the environmental sustainability of aquaculture practices is essential not only for guaranteeing compliance with the existing regulatory framework but also for improving the image of the European aquaculture sector. This should ultimately secure that the maximum economic potential of growth and employment is reached by the sector.

**Scope:**

Proposals should address one of the following issues (A) or (B), and should clearly indicate to which one they refer.

**A [2014] Optimizing space availability for European Aquaculture**

Proposals should provide operational tools for spatial planning (including Geographic Information Systems, remote sensing and mapping for data management, analysis and modelling, decision-support tools) to support national administrations and business operators in identifying the potential for aquaculture to expand in Europe in terms of space requirements and conflicts with other users. Proposals should also focus on the development of innovative applications allowing promotion of these tools and training of all the potential end users. The development of these tools should take into account specificities of different European aquaculture segments, while covering the regional diversity of the European aquaculture sector.

**B [2015] Consolidating the environmental sustainability of European aquaculture**

Proposals should compile existing and develop new tools for predicting and assessing the carrying capacity of the ecosystems at different geographic scales, taking into account specificities of the main European aquaculture segments and diversity of ecosystems in the main producing regions. They should also focus on improving existing and/or developing new integrated operational tools for the timely and cost-efficient environmental impact assessment of aquaculture production, in line with the requirements for the allocation of licenses for aquaculture businesses in the main producing European countries, as well as, for the implementation of the requirements set by the Marine Strategy Framework Directive in relation to aquaculture operations. They should also develop cost-efficient management tools and practices for improving the environmental sustainability of European aquaculture, including forecasting and modelling tools that can support and inform decision support systems, in situ observation technologies and early sensing and alarming systems. They should also develop adequate methodologies and assess the environmental and ecological services that different segments of the sector might provide.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 3 million for (A) and EUR 7.5 million for (B) 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 should show how some, or all, of the following impacts will be achieved:

- Support the Member States in establishing a coherent and efficient regulatory framework, implementing the Strategic Guidelines for the sustainable development of European Aquaculture and delivering a framework for sustainable growth.
- Support the development and implementation of coastal and marine spatial planning.

- Availability of new and efficient operational tools allowing national administrations to reduce the cost and time for delivering licenses for aquaculture operators.
- Contribution in creating enabling conditions for facilitating investments in European aquaculture through the provision of better observation, forecasting and decision support technologies.
- Availability of tools for reliable prediction and monitoring of environmental impacts of aquaculture operations.
- Strengthening the environmental sustainability of the aquaculture sector and enhancement of its image.
- Availability of tools for quantification of environmental services provided by the aquaculture sector

**Type of action:**

Research and innovation actions

## Save food and healthy diets and sustainable consumption

## SFS-13-2015: Biological contamination of crops and the food chain

**Specific challenge:**

The occurrence of biological contamination in various crops is of major concern as it has major implications for food and feed safety, food security and international trade. Worldwide, it is estimated that mycotoxins are responsible for losses of up to 5-10% of crop production. Contaminations are due to a series of events including weather conditions, possible climate change effects, land use, crop management and varieties as well as harvest and post-harvest techniques. Integrated approaches rather than isolated solutions are required to effectively control the incidence of mycotoxins in crops and reduce contamination throughout the feed and food chains.

**Scope:**

Proposals should aim at reducing the risk of mycotoxin contamination in crops and all along the feed and food chains. They should bring about technical, management and organisational solutions (including HACCP techniques) that are effective at the various stages of production as well as at pre- and post-harvest levels and also deal with the safe use of contaminated batches. Proposals should take into account the development of ICT solutions as well as reliable and cost effective control tools to policy-proposed solutions. Proposals should benefit conventional and organic supply chains and fall under the concept of 'multi-actor approach'34 and allow for adequate involvement of the farming sector in proposed activities. In line with the objectives of the EU strategy for international cooperation in research and innovation and in particular with the implementation of the EU-China dialogue, proposals are encouraged to include third country participants, especially those established in China35.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 3–5 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:**

- a toolkit (plant resources, management tools, technologies) to effectively monitor and reduce the incidence of mycotoxin contaminants in crop production as well as in the food and feed supply chains.
- contribution to legislation and standard setting
- safe use options for contaminated batches
- Reduced occurrence of mycotoxin contamination in crops in order to improve productivity and competitiveness of European agriculture and food sectors.
- reduced risks for human and animal health, and thus increase consumer confidence in agro-food products.

**Type of action:**

Research and innovation actions

## SFS-14-2014/2015: Authentication of food products

### Specific challenge:

The EU is the world largest producer, consumer and exporter of olive oil. Olive oil is normally sold at a higher price than other vegetable oils and fraudulent activities are tempting. To preserve the image of olive oil, it is necessary to guarantee its quality and authenticity. Olive oil characteristics are regulated at EU level by Regulation (EEC) N° 2568/91 which establishes a list of physical, chemical and organoleptic characteristics as well as methods for their analysis. The list and the methods are updated to include the existing scientific knowledge. Yet despite these regular revisions some issues have not yet found proper solutions. In particular there is a need for the development, validation and pre- as well as co-normative activities followed by the standardization of a method for the assessment of the organoleptic characteristics based on the existing methods, reference materials and already performed research and development work. The specific challenge consists in developing, validating and harmonising analytical methods and quality parameters that specifically address technical authenticity issues. These issues concern in particular 1) the blend of extra-virgin olive oil or virgin olive oil with soft deodorised olive oil, 2) the blend of extra-virgin olive oil or virgin olive oil with other vegetable oil. Beyond the case of olive oil, there is also a strong need for better coordination of research in the area of food authenticity, integrity and traceability across the food supply chain between Member States and Associated Countries.

### Scope:

Proposals should address one of the following issues (A) or (B), and should clearly indicate to which one they refer.

**A. [2014] Authentication of olive oil**

Proposals should evaluate fraud vulnerability in the olive oil sector and develop, validate and harmonise methods and analytical protocols to detect undesired processing (e.g. deodorisation), adulteration and to verify the quality of olive oil based on novel technological advances. Proposals should explore the establishment of a databank for olive oil and should contribute to standardisation. In line with the objectives of the EU strategy for international cooperation in research and innovation, proposals are encouraged to include participants not only from EU producer and consumer Member States, but also from third country36.

**B. [2015] Authentication of food products**

Proposals should aim at facilitating cooperation between European research funding bodies in the area of authentication of food products. They should aim at providing the basis for an exchange of information and future collaboration in relation to a) facilitating stock taking and analysis of recent or on-going research projects in this area with an emphasis on national projects in Member States; b) identification of future research priorities in this field and complementarities between activities at Member State and international level; and c) prepare the ground for an improved coordination of research, databases and approaches to verification of food authenticity, ensuring integrity and traceability along the food chain and among European countries. Beyond improving fraud detection, activities should aim at better anticipating and preventing frauds.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 5 million for (A) and 0.5 million for (B) 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 should show how some, or all, of the following impacts will be achieved:

- Generate with reliable, validated, cost efficient, harmonised and ready-to-use methods (based e.g. on genomic, metabolomic and other tools) to detect frauds and verify the quality of olive oil, which should be based on novel technologies and potentially feed into the standardisation activities and the regulatory framework related to olive oil quality (at the EU level and potentially at the international level) [A]
- lead to the creation of a databank of olive oils that is expected to be maintained after project completion [A]

- contribute to the implementation of the Action Plan for the EU olive oil sector [A]
- increase confidence of consumers and markets in olive oil quality [A] and other food products [B]
- improve the competitiveness of the olive oil [A] and of the food supply chain [B]

**Type of action:**

A: Research and innovation actions;

B: Coordination and support actions

## SFS-17-2014: Innovative solutions for sustainable novel food processing

**Specific challenge:**

Over recent decades, much research on innovative food processing technologies has been carried out with a view to combating pathogens, reducing spoilage and waste, optimising process efficiency, reducing the need for chemical preservatives, improving the functionality of foods, and improving the nutritional and sensorial properties of food responding to the demands of the different consumer niches and markets, also in terms of affordability. However, risks associated with scaling-up have often impeded real-scale demonstration of the viability of innovative solutions, and market failures and barriers have hindered the uptake of promising research and innovation results in novel food processing by industry and in the market. One way of supporting sustainable food security is through demonstration and first application in the market of eco-innovative solutions in sustainable novel food processing.

**Scope:**

Proposals could comprise activities such as prototyping, testing, demonstrating and piloting in a (near to) operational environment, as well as experimental production, all with a view to paving the way for subsequent market replication. Proposals may, possibly, include limited R&D activities. In cases where there are clear market failures or barriers to uptake, proposals could comprise activities such as validating the benefits for the users/buyers of the first application in real life operating conditions, validating technical and economic performance at system level, validating standards, as well as activities to prepare market uptake and ensuring optimal access to and dissemination of results. Participation of SMEs is encouraged.

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

**Expected impact:**

- Wider and faster deployment of innovative solutions for sustainable novel food processing resulting from greater user acceptance, higher visibility of innovative solutions and the creation of scalable markets.
- Improved competitiveness as well as opportunities for growth, diversification and job creation for the EU food (equipment) sector in general and SMEs in particular

**Type of action:**

Innovation actions

# Ocean observation technologies/systems

## BG-9-2014: Acoustic and imaging technologies

**Specific challenge:**

Acoustic and imaging technologies (including LiDAR59), combined with data processing have made considerable progress in the past 20 years and can provide remarkable insights into the state of marine ecosystems, from the water column to the seabed (and its habitats).

Acoustic technologies can be active (echosounder, multibeam sonar) or passive (devices to 'listen' and interpret marine sounds). They operate from a wide range of platforms, offer promising perspectives for characterising seabed and sea column habitats, species and ecology and can strongly support marine environment and fisheries management, as well as offshore activities and safety (e.g. detection of seeps, geologic events… etc.).

Imaging technologies have also proven to be powerful instruments to characterise the marine environment, its biomass, biodiversity, detect and provide estimates of pollution and marine litter. They can therefore be of important support to marine environment and fisheries management (e.g. marine litter assessment for the Marine Strategy Framework Directive - MSFD). However improvement is still needed to increase performance and cost efficiency of these technologies, whether it is to monitor the oceans, or to support marine industries.

Scope: Proposals should cover innovative technologies to improve the performance and the cost efficiency of underwater sensors and survey systems needed for acoustic detection, imaging or LiDAR, as well as the (fixed or mobile) platforms supporting them and signal and image processing to interpret raw data. Subsequent use of this information as part of an integrated framework of multi-modal data sources should also be considered.

Proposals should bring together marine scientists, technology providers and end-users (including policy makers), with a view to support implementation of MSFD, characterisation of good environmental status or to enhance a sustainable European maritime economy.

The Commission considers that proposals requesting a contribution from the EU in the range of EUR 4–6 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

**Expected impacts:**

- Strengthen the competitiveness and safety of the European maritime industry by developing innovative and cost efficient underwater acoustic and imaging technology devices and survey systems;
- Support the implementation of marine environmental and fisheries policies (MSFD – CFP), including the objectives for detecting marine litter;
- Support marine science and ocean discovery (seabed and sea column characterisation).

**Type of action:**

Research and innovation actions

# Horizontal aspects, socio-economic sciences, innovation, engagement with society and ocean governance across the blue growth focus area

## BG-12-2014/2015: Supporting SMEs efforts for the development - deployment and market replication of innovative solutions for blue growth

**Specific challenge:**

The potential of Europe's Oceans, seas and coasts is significant for job and growth creation if the appropriate investments in research and innovation are made. SMEs contribution to the development of the 'Blue Growth Strategy' (COM (2012) 494) can be significant in particular in the fields of marine biotechnology (related applications, key tools and technologies) as well as aquaculture related marine technologies and services.

However, SMEs lack access to finance to develop their activities and the economic and financial crisis has made access to finance even more difficult. This is particularly true in the previously mentioned maritime sectors, where access to finance for SMEs is considered as one of the most important barriers for the development of innovative maritime economic activities.

**Scope:**

The SME instrument consists of three separate phases and a coaching and mentoring service for beneficiaries. Participants can apply to phase 1 with a view to applying to phase 2 at a later date, or directly to phase 2.

**In phase 1,** a feasibility study shall be developed verifying the technological/practical as well as economic viability of an innovation idea/concept with considerable novelty to the industry sector in which it is presented (new products, processes, design, services and technologies or new market applications of existing technologies). The activities could, for example, comprise risk assessment, market study, user involvement, Intellectual Property (IP) management, innovation strategy development, partner search, feasibility of concept and the like to establish a solid high-potential innovation project aligned to the enterprise strategy and with a European dimension. Bottlenecks in the ability to increase profitability of the enterprise through innovation shall be detected and analysed during phase 1 and addressed during phase 2 to increase the return in investment in innovation activities. The proposal should contain an initial business plan based on the proposed idea/concept.

The proposal should give the specifications of the elaborated business plan, which is to be the outcome of the project and the criteria for success.

Funding will be provided in the form of a lump sum of EUR 50,000. Projects should last around 6 months.

**In phase 2,** innovation projects will be supported that address the specific challenge of Blue Growth and that demonstrate high potential in terms of company competitiveness and growth underpinned by a strategic business plan. Activities should focus on innovation activities such as demonstration, testing, prototyping, piloting, scaling-up, miniaturisation, design, market replication and the like aiming to bring an innovation idea (product, process, service etc.) to industrial readiness and maturity for market introduction, but may also include some research. For technological innovation a Technology Readiness Levels of 6 or above (or similar for non-technological innovations) are envisaged; please see part G of the General Annexes.

Proposals shall be based on an elaborated business plan either developed through phase 1 or another means. Particular attention must be paid to IP protection and ownership; applicants will have to present convincing measures to ensure the possibility of commercial exploitation ('freedom to operate').

Proposals shall contain a specification for the outcome of the project, including a first commercialisation plan, and criteria for success.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 2.5 million would allow phase 2 to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Projects should last between 12 and 24 months.

In addition, in phase 3, SMEs can benefit from indirect support measures and services as well as access to the financial facilities supported under Access to Risk Finance of this work programme.

Successful beneficiaries will be offered coaching and mentoring support during phase 1 and phase 2. This service will be accessible via the Enterprise Europe Network and delivered by a dedicated coach through consultation and signposting to the beneficiaries. The coaches will be recruited from a central database managed by the Commission and have all fulfilled stringent criteria with regards to business experience and competencies. Throughout the three phases of the instrument, the Network will complement the coaching support by providing access to its innovation and internationalisation service offering. This could include, for example, depending on the need of the SME, support in identifying growth potential, developing a growth plan and maximising it through internationalisation; strengthening the leadership and management skills of individuals in the senior management team and developing in-house coaching capacity; developing a marketing strategy or raising external finance.

**Expected impact:**

- Enhancing profitability and growth performance of SMEs by combining and transferring new and existing knowledge into innovative, disruptive and competitive solutions seizing European and global business opportunities.
- Market uptake and distribution of innovations tackling the specific challenge of Blue Growth in a sustainable way.
- Increase of private investment in innovation, notably leverage of private co-investor and/or follow-up investments.
- The expected impact should be clearly described in qualitative and quantitative terms (e.g. on turnover, employment, market seize, IP management, sales, return on investment and profit).

**Type of action:**

SME Instrument (70%)

# WORK PROGRAMME 2014-2015

## SPECIFIC PROGRAMME IMPLEMENTING HORIZON 2020

## SC3 - Energy Challenge

# EE3 – 2014: Energy strategies and solutions for deep renovation of historic buildings

## Specific Challenge

Around a quarter of the existing building stock in Europe was built prior to the middle of the last century. Many such buildings, often valued for their cultural, architectural and historic significance, not only reflect the unique character and identity of European cities but include essential infrastructure for housing, public buildings etc. A significant number of these historic buildings continue to use conventional inefficient fossil-fuel based energy systems typically associated with high energy costs and with greater than average CO2 emissions and cost of refurbishment.

The need to save costs increasingly leads to tighter rationing or shutdown of heating or cooling systems, further worsening conditions for conservation of the buildings, for artworks or collections as well as for living conditions.

Furthermore, changes in building-use and higher indoor comfort expectations than in the past are driving up demand for energy, a particular challenge when buildings of historic value are used or converted for residential, educational, retail, office or other purposes.

Due to the need to preserve authenticity and integrity, many recently developed solutions in the field of renovation are not compatible with or adequately adapted for use in historic buildings. This is particularly the case for listed or protected buildings.

It is also difficult to fully assess and model reliably the energy performance of the many different types of historic buildings across Europe or to assess the effect of energy efficiency measures or more sustainable solutions.

The scope for improved energy-efficiency of historic buildings is significant if addressed by holistic[1] and deep[2] renovation schemes that integrate innovative technologies, adapted standards and methodologies which consider the district dimension and stakeholder involvement.

Energy strategies and solutions for historic buildings have been identified as one of the priority areas in the roadmap of the EeB PPP.

## Scope:

Project proposals should focus on the development of innovative and affordable building renovation solutions for historic buildings that can deliver significant[3] improvements in energy performance while ensuring indoor comfort requirements and non-invasive, reversible solutions.

The emphasis should be on eco-innovation and sustainability by integrating cost-effective technologies for energy efficiency and renewable energy solutions.

Projects may address specific aspects such as innovative energy and environmental assessment methodologies (based on life-cycle and including specific non-monetary aspects in the cost/benefit and return on investment analysis), tools for planning and implementing the renovation of historic buildings, monitoring and control technologies and systems, non-invasive and non-destructive methods of surveying and diagnosis together with appropriate standards and information management for building maintenance.

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[1] *Considering all the refurbishment possibilities at building level together with opportunities at district level such as biomass, geothermal, district heating, etc.*

[2] *Deep renovation should lead to a refurbishment that reduces both the delivered and the final energy consumption of a building by a significant percentage compared with the pre-renovation levels (cf Directive 2012/27/EU on Energy Efficiency).*

[3] *Significant savings to both the delivered and the final energy consumption of a building compared with the pre-renovation levels (cf Directive 2012/27/EU on Energy Efficiency, Directive 2010/31 on the Energy Performance of Buildings )*

Projects should clearly demonstrate the effectiveness of the technologies, methodologies, systems or tools developed and prove the replication potential of the proposed solutions with, where appropriate, the use of case studies.

The Commission considers that proposals requesting a contribution from the EU of between EUR 3 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 be implemented under the PPP on Energy-efficient Buildings. The activities are expected to be implemented at TRL 4-6 (please see part G of the General Annexes).

### Expected Impact:

Optimised design and implementation of renovation projects for historic buildings and for listed and protected buildings in particular, delivering significant improvements in energy performance at both building and district level through more tailored solutions. Provision of effective guidelines and contribution to standardisation activities in this field. Reduced fragmentation in this sector through increased collaboration and cooperation and fostering of a more interdisciplinary approach and support to the implementation of the roadmap of the EeB PPP.

### Type of action:

Research and innovation action

## SIE 1 – 2014/2015: Stimulating the innovation potential of SMEs for a low carbon and efficient energy system

### Specific challenge:

SMEs play a crucial role in developing resource-efficient, cost-effective and affordable technology solutions to decarbonise and make more efficient the energy system in a sustainable way. They are expected to strongly contribute to one or a combination of more than one of the challenges outlined in the legal base of the Horizon 2020 Societal Challenge 'Secure, Clean and Efficient Energy'[4], in particular with regard to

Reducing energy consumption and carbon footprint by smart and sustainable use (including energy-efficient products and services as well as 'Smart Cities and Communities'),

Low-cost, low-carbon electricity supply (including renewable energy as well as CCS and re-use),

Alternative fuels and mobile energy sources,

A single, smart European electricity grid,

New knowledge and technologies, and

Robust decision making and public engagement

### Scope:

The SME instrument consists of three separate phases and a coaching and mentoring service for beneficiaries. Participants can apply to phase 1 with a view to applying to phase 2 at a later date, or directly to phase 2.

In phase 1, a feasibility study shall be developed verifying the technological/practical as well as economic viability of an innovation idea/concept with considerable novelty to the industry sector in which it is presented (new products, processes, design, services and technologies or new market applications of existing technologies). The activities could, for example, comprise risk assessment, market study, user involvement, Intellectual Property (IP) management, innovation strategy development, partner search, feasibility of concept and the like to establish a solid high-potential innovation project aligned to the enterprise strategy and with a European dimension. Bottlenecks in the ability to increase profitability of the enterprise through innovation shall be detected and analysed during phase 1 and addressed during phase 2 to increase the return in investment in innovation activities. The proposal should contain an initial business plan based on the proposed idea/concept.

The proposal should give the specifications of the elaborated business plan, which is to be the outcome of the project and the criteria for success.

Funding will be provided in the form of a lump sum of EUR 50.000. Projects should last around 6 months.

In phase 2, innovation projects will be supported that address the specific challenges outlined in the legal base of the Horizon 2020 Societal Challenge 'Secure, Clean and Efficient Energy' and that demonstrate high potential in terms of company competitiveness and growth underpinned by a strategic business plan. Activities should focus on innovation activities such as demonstration, testing, prototyping, piloting, scaling-up, miniaturisation, design, market replication and the like aiming to bring an innovation idea (product, process, service etc) to industrial readiness and maturity for market introduction, but may also include some research. For technological innovation a Technology Readiness Levels of 6 or above (or similar for non-technological innovations) are envisaged; please see part G of the General Annexes.

Proposals shall be based on an elaborated business plan either developed through phase 1 or another means. Particular attention must be paid to IP protection and ownership; applicants will have to present convincing measures to ensure the possibility of commercial exploitation ('freedom to operate').

Proposals shall contain a specification for the outcome of the project, including a first commercialisation plan, and criteria for success.

[4] Council decision XXXX establishing the Specific Programme implementing Horizon 2020 - The Framework Programme for Research and Innovation (2014-2020)

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 2.5 million would allow phase 2 to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Projects should last between 12 and 24 months.

In addition, in phase 3, SMEs can benefit from indirect support measures and services as well as access to the financial facilities supported under Access to Risk Finance of this work programme.

Successful beneficiaries will be offered coaching and mentoring support during phase 1 and phase 2. This service will be accessible via the Enterprise Europe Network and delivered by a dedicated coach through consultation and signposting to the beneficiaries. The coaches will be recruited from a central database managed by the Commission and have all fulfilled stringent criteria with regards to business experience and competencies. Throughout the three phases of the instrument, the Network will complement the coaching support by providing access to its innovation and internationalisation service offering. This could include, for example, depending on the need of the SME, support in identifying growth potential, developing a growth plan and maximising it through internationalisation; strengthening the leadership and management skills of individuals in the senior management team and developing in-house coaching capacity; developing a marketing strategy or raising external finance.

**Expected impact***:*

- Enhancing profitability and growth performance of SMEs by combining and transferring new and existing knowledge into innovative, disruptive and competitive solutions seizing European and global business opportunities.
- Market uptake and distribution of innovations tackling the specific challenges outlined in the legal base of the Horizon 2020 Societal Challenge 'Secure, Clean and Efficient Energy' in a sustainable way.
- Increase of private investment in innovation, notably leverage of private co-investor and/or follow-up investments.
- The expected impact should be clearly described in qualitative and quantitative terms (e.g. on turnover, employment, market seize, IP management, sales, return on investment and profit).

**Type of action:** SME Instrument (70%)

The special conditions related to this topic are provided along with the general conditions for this call.

## LCE 2 – 2014/15: Developing the next generation technologies of renewable electricity and heating/cooling

### Specific challenge:

Complementing the global challenges outlined above, the following technology-specific challenges have to be addressed in 2014:

**a. Photovoltaics**: Developing next generation high performance PV cells and modules – Highly efficient, novel PV concepts, need to be developed based e.g. on advanced materials and processes, and/or innovative approaches to light management and solar spectrum matching/modification. The challenge is to bring practical performance close to theoretical limits.

**b. Concentrated Solar Power (CSP):** Making CSP plants more cost competitive – Increasing the efficiency and reducing the construction, operation and maintenance costs of CSP plants are the main challenges. Innovative solutions and concepts are necessary in order to increase plant performance and reduce cost through improved components, improved plant control and operation, and innovative plant configurations.

**c. Wind energy**: Develop control strategies and innovative substructure concepts - There is a need for i) control strategies and systems for new and/or large rotors and wind farms (on- and offshore); ii) new innovative substructure concepts, including floating platforms, to reduce production, installation and O&M costs for water depths of more than 50m.

**d. Ocean energy**[5]**:** Develop emerging designs and components – Innovative designs and components are needed to ensure efficient and effective long-term cost reduction as well as to achieve high levels of reliability and survivability for at least 20 years in harsh conditions.

**e. Hydropower**: Boosting peak power through sustainable hydropower – Existing hydropower stations need refurbishment and this opportunity should be used to modernise the power plants. Therefore, innovative and improved turbines or generators and related main equipment having a more robust design allowing operation in a wider range of heads and loads to increase power output, improve efficiency and dynamics should be developed.

**f. Deep geothermal energy:** Development of new drilling technologies and concepts for geothermal energy – New drilling technologies and concepts are necessary to increase the number of economically viable geothermal resources, including in hard rock and high temperature/pressure conditions, and have a demonstrably smaller environmental footprint by comparison to existing drilling methodologies. Cross-fertilisation with hydrothermal oil and gas technologies and operations shall be explored.

**g. Renewable Heating and Cooling**:

*i.* **Solar cooling systems**[6] reliability remains uncertain causing high installation and operation costs and hampering acceptance Innovative solutions are needed to reduce the complexity of the installation, to improve components performance and reliability, and to ensure cost reductions.

*ii.* **Improving efficiency of biomass CHP systems while widening the feedstock base**[7] – Micro and small-scale CHP (0.5-250 kW and 0.25-1 MW input power respectively) have a high potential for heat and electricity production for decentralized applications. Cost

[5] *Marine energy is also addressed under the cross-cutting 'Blue Growth' focus area led by Challenge 2 (Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy), in particular under the area 'New Offshore Challenges'.*

[6] Projects selected under this heading might be considered contributing to the objectives of the SPIRE PPP depending on the centre of their activities.

[7] *Biomass supply is addressed in LCE 11 and LCE 12. Proposers are advised also to consult the work programme of the Bio-Based Industries JTI, which is expected to be published mid-2014.*

effective, robust and environmentally friendly micro and small-scale CHP systems with high thermal and electrical efficiency need to be developed allowing the use of solid, liquid or gaseous sustainable biomass feedstock, such as agricultural and forest residues, upgraded solid or liquid bioenergy carriers with higher energy density, industrial by-products and biogas/biomethane.

For 2015, the following technology-specific challenges have to be addressed:

**a. Photovoltaics**: Developing very low-cost PV cells and modules – Proposals are requested to develop very low-cost but highly performing concepts either reducing constraints on the demand on natural resources (low material use) or using low cost materials, while having efficient manufacturing processes of cells and of modules and improving device performance and durability for competitive energy costs. Proposals are also requested to explore innovative applications.

**b. Concentrated Solar Power** (CSP): Improving the environmental profile of the CSP technology – CSP plants rely on water for cleaning the reflecting surfaces, for power generation and for cooling. Innovative solutions are needed to significantly reduce or replace the water consumption while maintaining the overall efficiency of the CSP plants, and limiting their environmental impact.

**c. Wind energy**: Substantially reduce the costs of wind energy - There is a need for innovative integrated dedicated offshore systems (e.g. with a significant lower mass per unit power installed) to reduce production, installation and O&M costs for water depths of more than 50m.

**d. Ocean energy** [8]Ensure efficiency and effective long term cost reduction and high levels of reliability and survivability - There is a need to gather experience in open sea operating conditions, structural and power performance and operating data of emerging full scale wave and tidal energy convertors and components in single and/or multiple device configuration. For the overall development cycle a better resource assessment is needed as well.

**e. Hydro power**: Increasing flexibility of hydropower – Hydropower is still amongst the largest sources of renewable energy. The challenge is however to make hydropower in the >100MW range available in a time as short as possible. New technologies need to be developed to increase ramping rates and to allow start-stop-cycles to reach up to 30 times per day depending on head and volume, while lifetime of components and respective life time prediction methods under heavy-duty operating conditions are considerably improved while avoiding adverse effects on downstream water courses.

**f. Deep geothermal energy:** Development of new technologies and concepts for geothermal energy - New technologies and concepts for geothermal energy are necessary to increase the number of economically viable geothermal resources, including in hard rock and high temperature/pressure conditions, and to have a demonstrably smaller environmental footprint to existing technologies. Cross-fertilisation with hydrothermal oil and gas technologies and operations shall be explored.

**g. Renewable Heating and Cooling:**

i. *Solar heating for industrial processes*[9] The potential benefit of using solar heat above 200°C in industrial processes has been already acknowledged. Innovative concepts, processes and technologies for these applications are needed which can be easily integrated into existing industrial plants and processes.

[8] Marine energy is also addressed under the cross-cutting 'Blue Growth' focus area led by Challenge 2 (Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy), in particular under the area 'New Offshore Challenges'.

[9] Projects selected under this heading might be considered contributing to the objectives of the SPIRE PPP depending on the centre of their activities.

ii. *Improving efficiency of low emission biomass CHP systems while widening the feedstock base*[10] – Current residential-scale boilers can combust only one type of feedstock (e.g. wood chips, wood pellets). New flexible and robust residential-scale low emission boilers for heat applications need to be developed using a wider range of sustainable feedstock (including mixtures) with high ash content such as agricultural and forest residues, upgraded solid or liquid bioenergy carriers with higher energy density and industrial by-products.

**Scope:**

Proposals should address one or more of the technology-specific challenges described above, including between renewables areas, where new, innovative ideas are welcome. They should bring technology solutions to a higher TRL, from TRL 3-4 to 4-5 (please see part G of the General Annexes).

Technical issues, synergies between technologies, regional approaches, socio-economic and environmental aspects from a life-cycle perspective (including public acceptance, business cases, pre-normative and legal issues, pollution and recycling) need to be appropriately addressed where relevant.

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

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

Proposals shall explicitly address performance and cost targets together with relevant key performance indicators, expected impacts, as well as provide for development of explicit exploitation plans. Proposals should also indicate the current Manufacturing Readiness Level (MRL, see Appendix to this work programme) and the activities needed to keep the MRL aligned with the advances in the TRL that will be undertaken in the proposal to ensure the potential for exploitation.

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

Technological innovation related to the integration of renewable generation in the industrial and residential sectors can be addressed in the Energy Efficiency call or Smart Cities and Communities call. Improving the energy efficiency of district heating and cooling networks is addressed in the Energy Efficiency call.

**Expected impact:**

The projects are expected to have one or more of the general impacts listed below:

- Significantly increased technology performance.
- Reducing life-cycle environmental impact.
- Improving EU energy security.
- Making variable renewable electricity generation more predictable and grid friendly, thereby allowing larger amounts of variable output renewable sources in the grid.
- Increasing the attractiveness of renewable heating and cooling technologies by improving cost-competitiveness, reducing complexity and increasing reliability.
- Bringing cohesion, coherence and strategy in the development of new renewable energy technologies.
- Nurturing the development of the industrial capacity to produce components and systems and opening of new opportunities.

[10] Biomass supply is addressed in LCE 11 and LCE 12. Proposers are advised also to consult the work programme of the Bio-Based Industries JTI, which is expected to be published mid-2014.

- Strengthening the European industrial technology base, thereby creating growth and jobs in Europe.
- Reducing renewable energy technologies installation time and costs.
- Increasing the reliability and lifetime while decreasing operation and maintenance costs.
- Contributing to solving the global climate and energy challenges.

**Type of action:**

Research & Innovation Action

The conditions for this topic are provided in the general conditions for this call. [Link]

# WORK PROGRAMME 2014-2015

## SPECIFIC PROGRAMME IMPLEMENTING HORIZON 2020

## SC4- Transport

## MG.8.1-2014. Smarter design, construction and maintenance

**Specific challenge:**

Increasing the performance of transport infrastructure can be achieved through improving the productivity of the assets. In this context, key in the future will be to reduce drastically traffic disruptions of transport flows from inspection, construction and maintenance activities to accommodate increasing/changing traffic demand. This means fewer, faster, more sustainable and better planned interventions with maximum safety for the workers and other traffic participants.

**Scope:**

Proposals could address:

- Advanced, quick, cost-effective and flexible (modular) design, manufacturing, construction, maintenance, rehabilitation and retrofitting systems/techniques and materials.
- Self-monitoring, self-reporting, non-intrusive inspection and testing methods, including advanced predictive modelling.
- Reuse and recycling methods for low energy construction.

Research in this domain should aim at validation of innovative solutions, targeting specific European geographical areas where either new construction for the completion of an efficient transport network is needed, or advanced maintenance systems are necessary to improve and extend the capacity of the existing network.

International cooperation with third countries is encouraged, both with international partners willing to share advanced know-how, and with third parties (in particular neighbouring countries) needing technology transfer.

SME active participation is strongly encouraged with the aim of fostering open innovation.

Proposals can either focus on technological progress and further advancement in knowledge (Collaborative projects 100%) or on reinforcing networking among operators with a view to enhance the effectiveness of the sector (Coordination and Support Actions).

Expected impact: Proposals are expected to deliver the following results:

- Monitoring and management systems increasing infrastructure capacity.
- New construction techniques that enhance the performance and reliability of infrastructure.
- Extending the life span of ageing transport infrastructure.
- Development and application of effective and efficient materials, technologies and tools to meet cost-effectiveness and sustainability goals.
- Reduction of infrastructure construction energy intensity and subsequent $CO_2$ emissions.

The work in this area should support the transition towards zero traffic disruption from inspection, construction and maintenance by 2030 and boost the overall performance of European transport infrastructure.

**Type of action:**

1) Research and Innovation Actions (100% funding) – Two stage;

2) Coordination and

**Support Actions** – Single stage

# WORK PROGRAMME 2014-2015

## SPECIFIC PROGRAMME IMPLEMENTING HORIZON 2020

## SC5 Climate Action

## SC5-12-2014/2015: Innovative and sustainable solutions leading to substitution of raw materials

**Specific challenge**:

High-tech products, including electric and electronic equipment, green energy technologies or extreme applications, contain substantial amounts of certain Critical Raw Materials (CRM). Although the amount of CRM per product in general is very low, the huge number of products manufactured makes the total amounts very impressive. The prices and availability of CRM varies in time. There is therefore a need to find alternative solutions to replace certain CRM in concrete applications, or to diversify the supply of raw materials sources. Substitution of CRMs can also increase the recyclability of waste products, allowing for more efficient processes and reduce environmental impacts.

This specific challenge is identified in the Priority Area 'Substitution of raw materials' of the European Innovation Partnership (EIP) on Raw Materials.

**Scope:**

Proposals should develop solutions proving concept and feasibility at the level of TRL 3-5; please see part G of the General Annexes.

Related environmental and safety risks should be assessed for all proposed actions.

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

Proposals shall address only one of the following issues:

a) [2014] Materials for electronic devices: development of innovative and sustainable solutions for the appropriate substitution of critical and scarce raw materials in electronic devices, including substitution of indium in transparent conductive layers and substitution of CRMs in light sources, targeting appropriately materials and applications that are difficult to recycle and where there are limited prospects to increase primary supply within the EU. Proposals should actively involve end users from a variety of concerned sectors such as touch screen, flexible electronics, solar energy, lighting and the built environment (smart windows). Synergies with existing relevant initiatives should be ensured, in particular, with the Future & Emerging Technologies (FET) Flagship on graphene and the possible Photonics Public Private Partnership.

b) [2015] Materials under extreme conditions: development of innovative and sustainable solutions for the appropriate substitution of critical and scarce raw materials in applications under extreme conditions, such as substitution of CRM in heat resistant super alloys, in hard materials, critical alloying elements in bulk metals (steel, aluminium) or in corrosion resistant materials, targeting appropriately materials and applications that are difficult to recycle and where there are limited prospects to increase primary supply within the EU. Proposals should actively involve end users from a variety of concerned sectors, such as energy, transport, tooling and the process industry, and ensure synergies with existing relevant initiatives.

**Expected impact:**

In the longer term pushing the EU to the forefront in the area of sustainable raw materials substitution. Improved competitiveness and creation of new jobs in materials producing and downstream industries, demonstrated by a return-on-investment study. Significant contribution to reduced dependency on CRMs in the medium term. Contribution to the large scale adoption of the new cost-effective technology in the EU, measured by quantitative and qualitative indicators. Availability of new materials with improved performance under extreme conditions and for electronic devices. Contribution to achieving the objectives of the EIP on Raw Materials.

**Type of action:** Research and innovation actions

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

# WORK PROGRAMME 2014-2015

## SPECIFIC PROGRAMME IMPLEMENTING HORIZON 2020

## SC6-Inclusive societies

## REFLECTIVE-6-2015: Innovation ecosystems of digital cultural assets

### Specific Challenge:

The digital age has revolutionised our habits, behaviours and expectations. The utilisation of digital technologies for research in the humanities and social sciences demonstrates the need for innovation at the service of scholarship and its advancement. The shift to digital is impacting on identities and cultures and transforming the shape of the knowledge that we will transmit to future generations as our legacy. This specific challenge responds to the growing urge to share the wealth of cultural resources, research and knowledge in our collections. It will show how digital cultural resources can promote creativity and generate innovation in research, lead to richer interpretations of the past, bring new perspectives to questions of identity and culture, and generate societal and economic benefits. Europe's vast cultural heritage can be transformed into digital assets, whose integration and reuse through research-led methods can create value for European cultural institutions and heritage, tourism and the cultural and creative industries. The objective is to enhance the analysis of cultural resources to improve our understanding of how European identity can be traced, constructed or debated, and to use those resources to foster innovation across sectors.

### Scope:

Support and promote access to and resue of cultural heritage resources as part of research and innovation. Projects should enable new models and demonstrations of the analysis, interpretation and understanding of Europe's cultural and intellectual history and/or bring cultural content to new audiences in novel ways, through the development of new environments, applications, tools, and services for digital cultural resources in scientific collections, archives, museums, libraries and cultural heritage sites. The developed technologies or services should be generated in the context of humanities research perspectives (identity, culture, questions of place, historical and cultural knowledge) alongside meeting real user needs. They should stimulate cross-border, cross-lingual multi-disciplinary research of Europe's cultural heritage, enabling collaboration, partnerships and co-production of knowledge across sectors and communities of researchers and users. Proposals should demonstrate appropriate methods of re-using and repurposing digital assets, paving the way for wider exploitation of Europe's cultural resources and boosting innovation.

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

Activities under this topic will stimulate new research perspectives for the humanities and social science communities, provide innovative and creative methods for approaching cultural assets, generate tools and resources to access and exploit the rich and diverse European digital cultural heritage in a sustainable way, and promote further its use allowing its reinterpretation towards the development of a new shared culture in Europe.

It is expected that these activities will create a viable and sustainable cross-border, cross-lingual and/or cross-sector exploitation of European digital cultural heritage assets by putting into place new networks of researchers, scholars, ICT professionals and specialists of digital heritage.

### Form of funding:

Innovation actions

## REFLECTIVE-7-2014: Advanced 3D modelling for accessing and understanding European cultural assets

### Specific challenge:

The documentation of cultural assets is inherently a multimedia process, addressed through digital representation of the shape, appearance and conservation condition of the heritage/cultural object. The digital model is expected to become the representation (forever, for everybody, from everywhere) and research needs to acknowledge the changing role that reconstruction, preservation and conservation now play in the representation of heritage and its analysis. Given the key role the digital model now plays, it is vital that its representation benefits new scholarship, research and developments in interpretation alongside the practical elements of curation, display and dissemination of knowledge. The 3D representations should go beyond current levels of visual depictions, support information integration/linking, shape-related analysis and provide the necessary semantic information for in-depth studies by researchers and users. This will offer new perspectives to researchers and new understandings to citizens, research users and the cultural and creative industries.. Digital surrogates can add a laboratory dimension to on-site explorations, generating new, more innovative questions challenges for our knowledge. It also can originate new avenues in the way tangible cultural heritage is studied, visualised, curated, displayed and monitored, significantly improving our understanding of Europe's unique cultural diversity and our capacity to communicate rich narratives about the past.

This challenge requires collaborations across disciplines, technologies and sectors, such as history, archaeology, cultural studies, anthropology and other areas of humanities and social science research on one side, and creative practice and digital developments in areas such as design and visual arts on the other side. The generation of high quality 3D models is still very time-consuming and expensive, not least because the modelling is carried out for individual objects rather than for entire collections. Furthermore, the outcome of digital reconstructions is frequently provided in formats that are not interoperable, and therefore cannot be easily accessed and/or re-used by scholars, curators or those working in cultural and heritage industries. This presents a risk to the sustainability of the reconstructions. This topic allows for a scaling up of such approaches in seeking to create researcher-led actions that will increase capacity and capability in this area.

### Scope:

The specific challenge will be addressed by the focused actions:

a) Research on cost-effective technologies for advanced 3D modelling to enhance the understanding of cultural heritage. This interdisciplinary research should focus on developing new methods and tools for automated 3D modelling and analysis of physical cultural resources and assets (e.g. cultural heritage sites, monuments, sculptures, archaeological sites…) beyond simple digital reconstruction. Driven by the specific needs of the cultural heritage research community and research questions relating to culture and identity that can be enriched through new understandings of tangible heritage objects, projects can explore solutions such as the consolidation of imperfect data, spatio-temporal analysis, modelling/simulation of material degradation, joint reconstruction within and across collections and semantic-aware representation, taking into account the wide range of capture devices and sources of measurement data. Work should facilitate the creation of high-fidelity models of objects with particularly challenging features as regards surface, transparency, dimensions etc. Test-beds for such technological development should validate the practical application and analytic potential of new models for research, interpretation, scholarship and innovation in curation and dissemination. The resulting models should enable greater understanding of European tangible cultural assets by researchers and citizens as well as direct reuse for innovative and creative applications.

b) Devise standard formats for the semantic-aware 3D modelling of Europe's cultural heritage for researchers and practitioners. Proposals should extend or develop standard formats of 3D semantic-aware objects with a view to improve their archiving, reusability and sustainability. The proposed formats should enable easy exchange, publishing and use of 3D models that have been acquired or generated by a wide range of devices or software. Central goal of these standardisation activities is the applicability, usability and sustainability of the 3D models to the European and international research and cultural heritage communities.

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

**Expected impact:**

The research under this topic will provide new benefits to researchers through the development of cost efficient tools and effective methods for the modelling and understanding of Europe's cultural heritage. It will also promote interoperable standard formats for semantic-aware 3D modelling, analysis, and representation of cultural heritage in order to allow easy distribution, publishing and reuse of such models, which in turn will ensure sustainable cross-sector collaborative work in both development and research in future.

**Type of action:**

For a) Research and innovation actions

For b) Coordination and support actions, up to EUR 2 Million

# WORK PROGRAMME 2014-2015

## SPECIFIC PROGRAMME IMPLEMENTING HORIZON 2020

## SC7 - Secure societies challenge.

# Fight against crime and terrorism

## FCT-3-2015: Forensics topic 3: Mobile, remotely controlled technologies to examine a crime scene in case of an accident or a terrorist attack involving CBRNE materials

### Specific challenge:

In the event of an accident or a terrorist attack (including those involving CBRNE materials), the physical examination of the crime scene by hand may not be possible, or could be severely restricted due to the presence of hazardous material or risk of building collapse. Therefore, there is a need for the development of mobile, remotely- controlled technologies to enable an improved identification/detection of CBRNE materials and collection of forensic material / evidence in a variety of situations and conditions.

### Scope:

The proposal should focus on the "mobile, remotely controlled" characteristics of the technologies to be developed to enable the assessment of hazardous scenes where the deployment of personnel is difficult as a result of an accident or terrorist attack. This should include technologies to enable the verification of CBRNE materials through the identification / detection (including visual recognition) of the type of substance and the collection of forensic material / evidence. The output should be operational in a variety of weather and terrain conditions, and demonstrate that they are cost effective. Proposals should link with existing projects. Tools/technologies should have a minimal disruptive effect on the crime scene.

In addition, dual-use applications will be considered with possible synergies being established with the European Defence Agency.

Proposals addressing this topic may involve the use of classified background information (EU or national) or the production of security sensitive results. As such, certain project deliverables may require security classification. The final decision on the classification of projects is subject to the security evaluation.

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

### Expected impact:

An Improved remotely controlled identification / detection and collection of forensic evidence in case of accidents or terrorist attacks involving CBRNE materials. Higher cost effectiveness of CBRNE forensics. For industry, better understanding of modern operational CBRNE identification/ detection requirements, thus increasing the competitiveness of their mobile equipments and products.

**Type of action**: Research & Innovation Actions

## FCT-5-2014: Law enforcement capabilities topic 1: Develop novel monitoring systems and miniaturised sensors that improve Law Enforcement Agencies' evidence- gathering abilities

### Specific challenge:

Investigations on the activities of criminal organizations usually require Law Enforcement Agencies (LEAs) to use electronic equipment for legal recording, retrieving and monitoring of criminal activities in a safe and unnoticed way, while keeping for both the sensors part and the monitoring station all the legal, integrity and chain-of-custody requirements that will enable the presentation of evidences obtained this way at the Courts of Justice.

Requirements for this equipment are very different from those offered by available commercial devices. Depending on the operation, the periods of time that these electronic devices have to work can range from days to months or in real time. Access to the device could be limited or impossible. Secure remote operation over radio channel (or other type of communication channel, including GSM networks) should be possible. Other requirement may apply like small size for easy concealment, low power consumption for extended time life, robustness and self- protection in a

### Scope:

The task is to develop a new type of sensors and equipments, monitoring station and their associated communication channel for LEA operation on the field according to their specification and subject to their validation at the end of the project taking into account the societal acceptance of the proposed solutions. Participation of LEAs and experts in fundamental rights in the definition of requirements and validation of results is essential, as only end-users are familiar with the challenges they frequently have to face in real operations within criminal investigations, and as experts on fundamental rights are informed on the impact of new technologies on individual lives (in particular privacy) and which rules should consequently be respected.

Proposals for this topic shall ensure that the developed technologies are such as to be upheld in Court.

Proposals addressing this topic may involve the use of classified background information (EU or national) or the production of security sensitive results. As such, certain project deliverables may require security classification. The final decision on the classification of projects is subject to the security evaluation.

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

### Expected impact:

- improved LEA capabilities to conduct investigations by using novel monitoring systems and miniaturised sensors;
- increased crime prosecution capabilities:
- shorter court cases due to the availability of more solid court proof evidence
- increased privacy and data protection
- for industry better understanding of modern operational LEA requirements, thus increasing their competitiveness.

The outcome of the proposal is expected to lead to development from Technology Readiness Levels (TRL) 6 or above; please see part G of the General Annexes.

**Type of action:** Innovation Actions

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

## FCT-10-2014: Urban security topic 1: Innovative solutions to counter security challenges connected with large urban environment

### Specific Challenge:

European large urban environments are subject to various challenges and threats to urban security linked to their big size and large population. These challenges have also a strong impact on the security perception of the citizens and, by this; they can impact on the economic development and the quality of life.

Consequently, there is a growing need to go beyond the idea that only the law enforcement and criminal justice systems are tasked to tackle urban security challenges. On the contrary, new approaches and innovative solutions, including sustainable, affordable and transferrable security technologies, are needed to solicit citizens' engagement to prevent, mitigate and recover from the above-mentioned security challenges and to foster their direct participation in the improvement of the urban security conditions.

In this framework, and upon due consideration for the concerned ethical issues, recent technological advances and appropriate sensing mechanisms can help to make a city more transparent and readable as well as to empower the citizens in smart cities by ensuring that the main urban dynamics are unveiled and available to the public.

To this end, a bottom-up approach is sought to ensure that the above-mentioned approaches and solutions are satisfactorily responding to the needs of the end-users and of the citizens' community at large. There is a need for an interdisciplinary approach involving contributions from technological research and socio-economic disciplines, particularly architecture, anthropology, arts, economy, law, linguistics and sociology.

### Scope:

The proposed research should focus on the development of innovative solutions and technologies for urban security and resilience that, at the same time, intend to reduce the fear of crime and enhance the perception of security of the inhabitants of large urban environments.

Specific attention should be paid to technologically enhanced platforms that allow citizens both to share information and experiences in real-time streaming and to receive alerts and messages from security command and control centers.

The proposed action should take into account sustainable and low impact solutions and, possibly, rely on already set standards and tools. Modularity security and privacy by design should also be in the backbone.

The proposed research should take into consideration past and on-going EU research in this field. The testing and validation of the results from the proposed research should be carried out in several European cities. Strong synergies may be expected in the fields of 3D mapping, accurate positioning and timing services, GIS analysis functions and environment modeling, simulation and visualization technologies.

Finally, the consideration for a possible wider integration of new and existing digital technologies into sustainable and innovative security solutions is strongly welcome.

The Commission considers that proposals requesting a contribution from the EU of between €3m and €5m 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 Reduce the fear of crime and enhance the perception of security of the inhabitants of large urban environments.

Better addressing security challenges in large urban environments.

Increase the perception of security of citizens by empowering them, fostering their sense of belonging to a greater community.

Facilitating the engagement of citizens to improve the security conditions of smart cities.

Providing new market opportunities, especially for SMEs and entrepreneurs, to develop and produce innovative technologies for urban security.

The action is expected to proactively target the needs and requirements of users, such as citizens and local police forces.

The outcome of the proposal is expected to lead to development up to Technology Readiness Levels (TRL) 5; please see part G of the general Annexes. Form of funding:

**Type of action:** Research & Innovation Actions

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

## FCT-11-2014: Urban security topic 2: Countering the terrorist use of an explosive threat, across the timeline of a plot, including the detection of explosives in a flow

### Specific challenge:

Extensive research has been undertaken in recent years to enhance support to those involved in detecting and countering explosive threats. This research should propose innovative approaches to develop methods/technologies able to fill existing gaps or greatly improve already existing along the terrorist timeline, including:

Intelligence techniques to spot those preparing for an attack;

The inhibition of well-known precursors;

Detecting specific chemicals, and/or bomb factories and/or the Improvised Explosive Device (IED) in transit, and in particular in a flow of vehicles / people;

Neutralizing the IED and undertaking forensic and evidential work.

Furthermore, a substantial amount of research and development has been carried out for other purposes,that could be applied to efforts to counter IEDs and Home-Made Explosives (HMEs). For instance, federated sensors are being developed to detect air/water pollution in sewages, streets and buildings.

But up to now, no comprehensive research was undertaken to assess the effectiveness, the efficiency and the cost of all the developed methods/techniques (including those initially designed for a different purpose). Detecting an explosive threat inside a flow of vehicles or passengers (including carried bags) also remains a major challenge at the present day.

### Scope:

Proposals should address the full time line of a terrorist explosive plot. At each period of the time line, the project should assess the effectiveness of the supporting method/technology used to counter the threat at that period using credible scenarios based on real cases, including the evaluating the most effective integration and association of existing technologies along the timeline.

Scenarios should take into account the type of explosive (e.g. home-made, conventional) and the means of transit and deployment (e.g. person-borne, vehicle-borne, left baggage), as both of these factors will have an influence on how effective a given combination of methods/technologies will be.

On detection in transit, projects should focus on the optimal combination of several existing technologies, for example spectroscopic stand-off detection; active/passive imaging for hidden objects detection; dogs (or other animals); automated CCTV tracking; multi-sensor data treatment. It should also cover the best way to locate sensors, taking into account realistic operational conditions and past event scenarios. In addition, technologies should be developed to fill identified detection gaps, such as e.g. bio-inspired technologies, stand-off-eye-safe spectroscopy, tomography, radar imaging, polarimetry etc.

In addition, the proposal should identify the weakness of the current defenses on IED and the best candidates to make them better.

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

### Expected impact:

Better understanding of the effectiveness of the supporting method/technology used to counter the terrorist use of an explosive threat.

Allowing those involved in counter-terrorist activities (e.g. Law Enforcement Agencies, bomb disposal units, Security & Intelligence Agencies, and Government Laboratories) to make proper choices in the application of new tools and technologies.

Better understanding of the combination of technologies required to detect and locate an explosive threat inside a flow, providing security and police forces with enough information so that they are able to take quick and effective decisions.

Contribution to a considerable improvement in the field of public security.

The outcome of the proposal is expected to lead to development up to Technology Readiness Levels (TRL) 7; please see part G of the general Annexes.

**Type of action**: Research & Innovation Actions

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

# Disaster resilient societies

## DRS-2-2014 Crisis management topic 2: Tools for detection, traceability, triage and individual monitoring of victims after a mass CBRN contamination and/or exposure

### Specific challenge:

A fast detection of exposure or contamination with CBRN substances (including toxins) using traceable tools and rapid identification of critically exposed individuals is essential to gain time in the triage of victims in case of accidents or terrorist attack. Research on traceability and monitoring of a large number of people in case of a massive CBRN incident is therefore needed to differentiate between contaminated and/or exposed persons and those individuals not contaminated persons on-site or in hospital zones.

### Scope:

The objective of this topic is to integrate existing tools and procedures along with the development of novel solutions in order to rapidly determine, in case of accidents or terrorist attack, if victims have been exposed/contaminated or not (by a CBRN agent) as well as the level of contamination / exposure (including making use of point of care diagnostic tests), develop and establish a decontamination / treatment / medical follow up based on the level of contamination / exposure, ensure the tools and procedures fit in overarching search & rescue systems, establish guidelines for hospitalisation and admission to intensive care units (or other specific units) based on the contamination evaluation. A special attention should be given to gender, ethical, religious and privacy aspects, for instance for pregnant women, disabled individuals, etc. The ethical implications and social acceptance of the proposed solution needs to be studied, contributing to an improved cooperation between science and society. Dual-use aspects will be considered with possible synergies being established with the European Defence Agency. Existing networks of end users from all affected fields (e.g. defence/security experts, firemen, rescuers) need to be actively involved in both technologies and procedures.

The Commission considers that proposals requesting a contribution from the EU of between €5m and €12m would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

### Expected impact:

- faster and more efficient treatments, detection and monitoring technologies of exposure to or contamination with CBRN substances (including toxins) in the case of accidents or terrorist attacks;
- new integrated, interoperable and centralised system to improve the triage and monitoring of victims, including the reduction of risks of cross-contamination between non-contaminated and contaminated victims.
- improved CBRN (including toxins) detection and monitoring capabilities;
- improved crisis management in case of a mass contamination/exposure through integration of information via a centralised system, involving all relevant stakeholders.
- improved cooperation between science and society through ethical screening of the developed solutions;
- higher cost-efficiency through dual-use applications;
- contribution to ongoing standardization work.

The action is expected to proactively target the needs and requirements of users, such as national law enforcement agencies, first responders and civil protection units in the CBRN area.

**Type of action**: Innovation Actions

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

# Border security

## BES-2-2015: Maritime Border Security topic 2: Low cost and "green" technologies for EU coastal border surveillance

### Specific challenge:

The use of low cost and "green" technologies is expected to become mandatory for future border control systems in environmentally sensitive areas. Systems of passive (or low emission) radar technologies or other relevant technologies provide promising results for the detection of targets in areas that cannot be covered by active systems. Passive radars fit this application, due to electromagnetic invisibility, lower detectability and cost and the possibility of use practically anywhere.

R&D is needed to better apply this technology maritime surveillance, also in combination with other systems, and using the signals coming from existing systems.

### Scope:

The areas of research and development are expected to include, among others:

1. further development of devices and sensors for maritime targets and environment (e.g. fit for mobile platforms)

2. development of specific tracking and fusion algorithms

3. operation in network configurations together with other systems for improved performances

The Commission considers that proposals requesting a contribution from the EU of between €3m and €5m 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 impact of the research will be benchmarked against the potential for integration of novel technology into current border surveillance systems in order to redress its limitations. This topic would contribute further to the development of the European Border Surveillance System[11] (EUROSUR) and the CISE. Innovations shall be able to seamlessly cooperate and interface with existing infrastructure supporting the CISE constituent communities.

**Type of action**: Research & Innovation Actions The conditions related to this topic are provided at the end of this call and in the General Annexes.

[11] *The aim of EUROSUR is to reinforce the control of the Schengen external borders. EUROSUR will establish a mechanism for Member States' authorities carrying out border surveillance activities to share operational information with a view to reduce the loss of lives at sea and the number of irregular immigrants entering the EU undetected, and increase internal security by preventing cross-border crime such trafficking in human beings and the smuggling of drugs.*

## BES-6-2015: Border crossing points topic 2: Exploring new modalities in biometric-based border checks

### Specific challenge:

The ever-growing number of travellers crossing the EU borders poses a serious challenge to the border control authorities in terms of a reduced amount of time for carrying out border checks. Consequently, efforts are being undertaken to facilitate the travel of bona-fide and genuine passengers and simultaneously to safeguard high level of security. In particular, in the field of person and document authentication and/or verification, the deployment of biometric-based approaches led to significant advances as regards making the border control processes more efficient. Further explorations, going beyond state-of-the-art, of biometric-based person identification detection techniques are expected to contribute to making the daily work of border control authorities more efficient and to significantly facilitating bona-fide non-EU citizens in crossing EU external borders.

### Scope:

Research is needed in order to explore whether it is possible to use other biometric data (potentially already used in another context and in another domain) than fingerprint, iris or facial picture to store in the e-Passport chip, which would guarantee the same or higher level of security, but would be more accurate and could be retrieved in a more efficient manner than in the case of the conventionally used biometric data types. In addition, practical experiences lead to the assumption that for non-critical travelers (EU, bona-fide etc.) a most fluent non-intrusive control process is desired. Therefore, to increase accuracy, in this case the use of contactless techniques (e.g. face, 3D face, iris) and multi-biometric fusion is likely to be preferred over contact-based technologies.

While the introduction of new biometric-based modalities in the process of person identification might lead to making this process more accurate and efficient, an integral part of the research should also embrace the related ethical, societal and data protection aspects. Work should include optimization of the use of current biometric modalities and consideration of how services offered by countries outside of the EU may result in a more efficient and user-friendly experience for the traveler. The development of modeling techniques and the creation of datasets for use by academics and commercial entities should be a priority. The work carried out should also include research on the theme of multi-modal biometrics in border control.

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

### Expected impact:

Non-EU residents contributed €271 billion to the economy of Member States and Associated Countries when travelling to the EU in 2011. Business travellers, workers, researchers and students, third country nationals with family ties to EU citizens or living in regions bordering the EU are all likely to cross the borders several times a year. Making it as easy as possible for them to come to the EU would ensure that Europe remains an attractive destination and helps boosting economic activity and job creation. The outcome of the research should be assessed in terms of potential to improve border management and control modalities facilitating travel without compromising security. The expected impact is to make the daily work of border control authorities more efficient and to significantly facilitate bona-fide non-EU citizens in crossing EU external borders.

**Type of action:** Research & Innovation Actions.

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

## BES-8-2015: Supply Chain Security topic 1: Development of an enhanced non-intrusive (stand-off) scanner

### Specific challenge:

Smugglers try to evade controls at borders by using their bodies as the conduit to conceal prohibited or restricted goods. These items may be narcotics, explosives, currency and weapons and could also be ampoules containing chemical and biological threats. All these items could remain undetected by conventional technologies.

There is a need to develop body-scan technology able to discern those commodities sought by Customs from benign materials carried by travellers. The device/system should have the capability to automatically identify the chemical composition of the main threat commodities. Such systems are expected to improve efficiency of inspection of suspected individuals, improve security at the border and act as a deterrent to other potential smugglers.

### Scope:

There are two different scenarios that technology is required for. Although ideally a system would have a capability to be deployed to cover both operational situations, it is accepted that at this stage it may not be possible, due to the types of core technology used, so within this topic the requirements are shown separately to clarify the challenge, and so assist development in proposals which may be for either a sub category or for a combined solution.

1) Internally concealed commodities

Packages may be ingested, or inserted into body orifices. Ingested packages may be formed of compressed powder, or even liquid and may weight from a few hundred grams up to over a kilo. Non-ingested items may be several hundred grams. Drugs, used in the example, are by nature organic, so it is difficult to distinguish them visually from other organic or food waste in the digestive system of the human body. Transmission x-ray is a useful tool, but it is an imaging technology which requires interpretation. There is a potential for error and packages may be missed.

There is a requirement to develop a body-scanner capable of identifying and alerting an operator to specific threats (such as narcotics /explosives etc.) concealed inside the body. If the technology in the proposal were to utilise ionising radiation, it would have to comply with European limits of dose. It should also be noted that not all Member States and Associated Countries permit use of ionising radiation for non-medical purposes.

2) Externally concealed commodities.

Packages such as drugs can be concealed beneath clothing and even be moulded to map the body contours, which can be compensated for by the wearing or larger clothing. A human can conceal up to 5 kilos in this manner, which can be remain undetected. Millimetre wave technology offers some potential for detection; however these are only anomaly detectors and cannot distinguish between threat and benign materials. Organic materials which have been on the body for a significant duration can become opaque to some technologies if they are close to the body temperature. The ideal novel solutions must be able to distinguish those materials of Customs or Police/Security interest from harmless items and alert the operator. This solution would typically be applied to a “non-divest” situation. It must be able to work in real-time, not to disrupt passenger flow or movement of a crowd. Preferably the solution should be able to deal with more than one person within the field of view, or at least other people in the frame should not interfere with the performance of the primary target. Performance will have to be validated in a realistic scenario.

The technology should pose no risk to particular groups, or those with health issues (children, pregnant woman, pacemakers). The privacy of individuals must be respected.

The Commission considers that proposals requesting a contribution from the EU of between €2m and €5m 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 EU's strategy for international cooperation in research and innovation53 international cooperation is encouraged, and in particular with international research partners involved in ongoing

discussions and workshops, and US homeland security research entities. Funding for third countries is however still subject to the evaluations.

**Expected impact:**

The technology to be developed under (1) and (2) would be operated by Customs/Border control staff and is expected:

- to exceed the capability of current technologies being used by Customs administrations in some Member States;
- to significantly improve security at the border;
- to constitute an effective tool against organised crime;
- to lead to increased crime prosecution capabilities; - to lead to increased privacy and data protection.

The impact of the research should be benchmarked in terms of future deployment, as proportionate to the risks being assessed, and taking into account realistically the expected improvements in performance, functional needs, conditions of use, future maintenance costs, and impact on operating procedures, including training requirements for new skills.

The outcome of the proposal is expected to lead to development up to Technology Readiness Level (TRL) 5; please see part G of the General Annexes.

**Type of action:** Research & Innovation Actions.

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

## BES-9-2014: Supply Chain Security topic 2: Technologies for inspections of large volume freight

### Specific challenge:

Approximately 70% of all cargo is transported in intermodal shipping containers representing approximately 240 million container moves in any given year. As a major trans-shipment hub, the EU handles around a third of the container moves throughout the world. Container security associated with terrorist threats, illegal immigration, theft and smuggling is therefore an important factor in the overall EU border security.

The greatest volume (and risk) of illegal/illicit/mis-declared goods into the EU, as of interest to Customs, include, but are not limited to: illicit narcotics (heroin, cocaine, etc.) explosives, tobacco products, chemicals. Intelligence together with scanning is useful in narrowing suspicious consignments, but ultimately a physical examination of the load is required. This is resource intensive and adds cost and delay to importers, should the anomaly be found to be benign.

### Scope:

The Customs currently employ a limited amount of technology to assist in working on its largest problem: how to counter hiding/smuggling in large volume freight. Thus far the technology of choice is X-ray interrogation (supported by risk-selection). Ideally, upon effective risk selection, the most effective (array of) technology out of a number of availabilities should be selected to screen the freight. The best results (relative low false-positive, relative low false negative) is expected to be achieved in a situation in which (at least) two independent technologies are employed in conjunction.

The research should explore options for parallel development of at least two different technologies for container scanning, for instance:

1) Atomic property based interrogation (e.g. X-ray, muon, neutron), particularly to detect threat materials shielded in dense cargos, interrogation technology being directed towards the detection of organic products of relevance to Customs;

2) Evaporation based interrogation (e.g. mass spectrometry, biological detection, ion mobility spectrometry), with targeted selectivity at approximately femtogram/ litre level, to be directed towards a wider scope.

It is difficult to predict a priori which technology will yield the most practical solution. Therefore, these combined approaches should be validated in an operational scenario, to come up with practical, wide scope, detection tool to be used on large volume freight (e.g. containers and large pallets). The solutions proposed should address the employment of innovative technologies, which have been demonstrated to be able to dramatically enhance the performance of imaging and sensor systems.

Proposals addressing this topic may involve the use of classified background information (EU or national) or the production of security sensitive results. As such, certain project deliverables may require security classification. The final decision on the classification of projects is subject to the security evaluation.

The Commission considers that proposals requesting a contribution from the EU of between €5m and €12m 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 EU's strategy for international cooperation in research and innovation54 international cooperation is encouraged, and in particular with international research partners involved in ongoing discussions and workshops, and US homeland security research entities. Funding for third countries is however still subject to the evaluations.

### Expected impact:

The research is expected to provide a substantial contribution in the prevention of the unlawful transport of dangerous and illicit materials, also protecting critical elements of the supply chain from attacks and disruptions. A technology which could scan a load with high probability of detection of particular key commodities would increase efficiency and throughput and reduce cost and delays to innocent shippers. Solutions are therefore to be developed to allow for an increased assurance level in particular for dense

containerized cargo, avoiding the need to unnecessarily resorting to physical inspection. As the research should facilitate and expedite the smooth flow of legitimate international trade through improved security controls, it would support the work of WCO for high risk cargo.

The outcome of the proposal is expected to lead to development up to Technology Readiness Level (TRL) 7; please see part G of the General Annexes.

**Type of action:** Research & Innovation Actions.

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

# Cybersecurity and Privacy

## DS-2-2014: Access Control

### Specific challenge:

Security includes granting access only to the people that are entitled to it. Currently the most widespread approach relies on passwords. Managing the passwords has its limits and poses a challenge to the user, which adds vulnerabilities. Common practice is to use the same or similar password, which increases significantly the risk should the password be broken.

### Scope:

The focus is on the development and testing of usable, economic and privacy preserving access control platforms based on the use of biometrics, smart cards, or other devices. The solutions are to be installed and tested in a broad-band network, giving access to smart services running over networks with state-of-the-art security, avoiding single points of failure. Proposed work should include the management of the access rights in particular for the service providers, ensure the security and privacy of the databases, facilitate a timely breach notification and remediation to the user, and reduce the insider threat.

The proposed solutions have to guarantee interoperability and portability between systems and services, sparing the user to have to install a platform, service or country specific technology.

Proposed work could assist the objective of implementing a secure information sharing network.

The Commission considers that proposals requesting a contribution from the EU of between €3m and €8m EURO would allow this topic to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

### Expected impact:

Actions supported under this objective will deliver secure, but user-friendly, access to ICT systems, services and infrastructures, resulting in a consumerisation of devices for access control. The level of security of online services and critical infrastructures protected by these access systems should be demonstratably higher than by the state-of-the-art approach. The proposed solutions are expected to support the creation of commercial services making use of electronic identification and authentication.

**Type of action:** Innovation Actions.

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

# WORK PROGRAMME 2014-2015

## SPECIFIC PROGRAMME IMPLEMENTING HORIZON 2020

## Leadership in enabling and industrial technologies (LEIT)

### *i). Information and Communication Technologies (ITC)*

## ICT1-2014: Smart Cyber-Physical Systems

### Specific Challenge:

Cyber-Physical Systems (CPS) refer to next generation embedded ICT systems that are interconnected and collaborating including through the Internet of things, and providing citizens and businesses with a wide range of innovative applications and services. These are the ICT systems increasingly embedded in all types of artefacts making "smarter", more intelligent, more energy-efficient and more comfortable our transport systems, cars, factories, hospitals, offices, homes, cities and personal devices. Focus is on both reinforcing European industrial strengths as well as exploring new markets.

Often endowed with control, monitoring and data gathering functions, CPS need to comply with essential requirements like safety, privacy, security and near-zero power consumption as well as size, usability and adaptability constraints. To maximise impact and return on investment in this field, the following challenges must be addressed:

De-verticalising technology solutions with CPS platforms that cut across the barriers between application sectors including mass consumer markets.

Bringing together actors along the value chain from suppliers of components and customised computing systems to system integrators and end users.

Creating new ICT Platforms for both vertical and core markets from automotive, health, smart buildings and energy to wireless communications and digital consumer products and services.

### Scope:

Activities Activities should address the development of new paradigms, concepts, and platforms or toolboxes laying the foundation for future generations of CPS. Participants should include suppliers and users of CPS, tool providers, suppliers of sub-systems, system integrators, auditors/certification bodies of systems and related academia and research institutes (including Social Sciences and Humanities).

**a. Research & Innovation Actions** should cover one or both of the following themes:

Modelling and integration frameworks: modelling techniques and comprehensive integrated tool chains for clearly defined use cases. Major aspects to be addressed include the holistic modelling of the system behavioural, computational, physical and/or human aspects of CPS; and the seamless interoperability between CPS tools. Solutions should ensure flexibility and tractability of systems.

Smart, cooperative and open CPS: Methods for engineering Cyber-physical Systems that are able to respond in real-time to dynamic and complex situations while preserving control, system safety, privacy, reliability, energy efficiency and dependability features, and addressing security and privacy "by design" across all levels. This includes CPS that are aware of the physical environment, enabling effective and fast feedback loops between actuation and sensing, possibly with cognitive and learning capabilities; further CPS with cooperation and negotiation capabilities supporting distributed services, autonomous, reactive and targeted problem solving and/or improved man-machine interaction. Also covered are open and heterogeneous CPS and Systems of Systems to facilitate seamless connectivity, dynamic reconfiguration as well as handling of emergent properties. The developed methods should enable evolutionary, adaptive and iterative system life-cycles and guarantee Quality of Service at functional and extra-functional level.

Projects are expected to be driven by industrial requirements, to be well balanced between industry and academia, and to include a demonstration and validation phase with realistic use cases.

**b. Innovation Actions** will stimulate innovation and connect innovators across value chains in view of broader adoption of novel embedded and cyber-physical systems technologies and their enablers in industrial and societal applications. Proposals should cover one or both of the following themes.

**Towards platforms and ecosystems**: Prepare reference architectures and platforms for open, smart and co-operative CPS applicable across sectors and application domains, including industrial consensus building, reference implementations, pre-normative activities, proof-of concept demonstration, user involvement and validation in key application domains. Proposals requesting a Small contribution are expected.

**Towards a "smart everywhere" society:** Support will go to the establishment of European networks of embedded systems design centres. The networks' goal will be to help businesses from any sector uplift the quality and performance of their products and services with innovative embedded ICT components and systems. This will be done through a number of development and experimenting actions conducted with the help of the centres. Clustered in large scale projects and driven by user requirements, these experiments must facilitate users-suppliers partnerships across value chains and regions. With special emphasis on SMEs and mid-caps, focus is on technologies and processes, which are customised, integrated, tested and validated at the system level. The network must include vertical competences from embedded software and systems down to the components subsystems and components level and foster collaboration and trust, as well as openness and pre-normative measures. Work should build on and be complementary to EU, national and regional activities such as pilot projects in ENIAC, ARTEMIS and ECSEL.

Proposals requesting a Large contribution are expected. The action may involve financial support to third parties in line with the conditions set out in Part K of the General Annexes. The consortium will define the selection process of additional users and suppliers running the experiments for which financial support will be granted (typically in the order of EUR 50.000 – 150.0001 per party). Maximum 50% of the EU funding requested by the proposal should be allocated to this purpose.

**c. Support Actions** for cross-sectorial platform-building, structuring of constituencies and road-mapping, dissemination of programme achievements and impact analysis, development of a strategic collaboration agenda for pre-competitive research on the foundations of modelling and simulation of CPS with the US, consensus building related to business models and non-technical societal and legal issues relevant to the wider diffusion of embedded and cyber-physical systems (e.g. human behaviour, social aspects, liability, security and privacy).

### Expected impact:

- Reduction of development time for CPS by 30% as compared to the state-of-the-art in 2013 and significant reduction in maintenance costs.
- Stronger pan-European collaboration across value chains and technology levels from the components and hardware to higher systems level creating open innovation eco-systems and stimulating consensus building on open tools, platforms and standards.
- Development in Europe of a competitive offer for next generation core ICT platforms spanning from operating systems and middle ware to application development and deployment tools with built-in security. This should translate into a significant increase of Europe's market share in this area and in higher added value generated from embedded ICT.
- Uplifting Europe's innovation capacity and competitiveness across all economic sectors with the wider adoption of networked embedded ICT, notably in SMEs.

### Types of action:

- a. Research & Innovation Actions – A mix of proposals requesting Small and Large contributions is expected
- b. Innovation Actions – A mix of proposals requesting Small and Large contributions is expected
- c. Coordination and Support Actions
- The conditions related to this topic are provided at the end of this call and in the General Annexes.

## ICT2- 2014: Smart System Integration

### Specific Challenge:

The aims are to develop the next generations[12] of smart systems technologies and solutions, based on systemic miniaturisation and integration, of heterogeneous technologies, functions and materials, and to establish European competitive ecosystems for the design, R&D, prototyping and testing, manufacturing and industrialisation of smaller, smarter (predictive, reactive and cognitive) and energy autonomous Smart Systems. These ecosystems will provide services for cost efficient access to European manufacturing capabilities and expertise, including training, design and pilot line production and testing, in particular for new users of Smart Systems.

This specific challenge contributes to the strategy of micro and nano electronics KET in the area of More than Moore and complements the activities of topic ICT25.

### Scope:

The focus is on:

**a. Research & Innovation** Actions for one or both of the following:

- To advance the state of the art of heterogeneous integration of micro and nanotechnologies (nanoelectronics, micro- electro-mechanic, magnetic, photonic, micro-fluidic, electrochemical, acoustic, bio/chemical principles and microwave technologies) into smart systems.

Work will be driven by industrial requirements and specifically target multi-disciplinary R&D in the following areas:

- Miniaturised systems based on high density 3-dimensional heterogeneous integration.

- Autonomous deployable smart systems that include efficient energy management (Zero Power technologies) and energy harvesting from their operating environment,

- Advanced Smart systems with multi-functional properties, including sensing, storing, processing, actuation and ultra-wideband communication.

Actions may address performance, design and testing, but the focus will be on the integration into systems, including manufacturability and packaging.

- Research and development of application specific smart systems. Work will be driven by users-requirements and will target concrete solutions. It will exploit the convergence of key enabling technologies, focusing on the synergies between micro-nanoelectronics and biotechnologies.

Work should develop along the full value chain and include validation of results in realistic environments and business cases. Relevant industrial supplier(s) in the addressed application(s) must be included in the consortium. Actions should include tests, end-of life and recyclability issues.

**b. Innovation Actions** target access services for academia, research institutes and SMEs to accelerate the deployment of smart systems and enable the access to design and manufacturing capabilities for prototyping, early validation and first production. Assessment for technology suppliers in smart systems will target the evaluation of equipment, processes and building blocks with potential customers.

**c. Pre-commercial procurement** action will focus on enabling the take-up and deployment of lab on chip based technology developments for in-vitro diagnosis.

**d. Coordination and Support Actions**

- Networking and collaboration among and with clusters in smart system integration in order to promote, create awareness and establish roadmaps.

[12] According to EPoSS (European Technology Platform for Smart Systems Integration) Strategic Research Agenda

- Surveying and coordinating the consideration of societal issues and users' requirements across the projects.
- Training activities or organisation of conferences in the area of smart systems integration.

Actions should ensure close synergies with national/regional R&D activities when relevant.

## Expected impact:

**a. Research & Innovation Actions**

- Increased integration and combination of new functionalities at micro- and nano scale, with decreased size (x10), decreased costs (x10), increased predictive and cognitive functions and increased autonomy with energy management and scavenging,
- Secured and reinforced European leadership in the microsystem sector, expanding its share in smart systems for medical, telecom, consumer, safety and security, energy and transport applications,
- Seized new opportunities in addressing societal challenges, e.g. in health, well-being, environment and food/beverage quality and safety.

**b. Innovation Actions**

- Wider adoption of miniaturised smart systems in innovative and sustainable products meeting industrial and end-users needs in a broad range of applications and sectors.
- Overcoming the "valley of death" in bioelectronics by building the full innovation chain, and best practices in validation, regulation and market exploitation.

**c. Pre-commercial procurement action**

- Increased awareness, access and adoption of innovative solutions by European public procurers in healthcare.

**d. Coordination and Support Actions**

- More coordinated R&I activities in smart systems integration in Europe; increase awareness, education and training skills.

## Types of action:

a. Research & Innovation Actions – A mix of proposals requesting Small and Large contributions are expected

b. Innovation Actions – A mix of proposals requesting Small and Large contributions are expected

c. Pre-Commercial Procurement (PCP) Co-fund actions – Proposals requesting a Small contribution are expected

d. Coordination and Support Actions

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

## ICT 6 – 2014: Smart optical and wireless network technologies

Specific Challenge: Network traffic is expected to keep on showing two-digits annual growth rates in all network segments over the coming years and beyond. The limits of existing technological approaches for both optical and wireless technologies are about to be reached. As far as access networks are concerned, the cost of current solutions also represents a barrier to reaching a (quasi-) universal coverage with ultra-high speed, be it with optical or wireless access. New challenges imposed by major trends in the usage of communications networks are to be taken into account as well as the high projected increase of mobile and ubiquitous broadband access which requires further developments in backhaul networks, for which optical and wireless technologies constitute key enablers.

In the specific wireless domain, spectrum is a scarce public resource whose usage is often strategic for the economy and society, which must be optimised in view of the expected exponential traffic and usages growth as outlined in the Commission Communication on "Promoting the shared use of radio spectrum resources in the internal market"[13]. Finally, communication networks represented about 22% of the ICT carbon footprint in 2011. This is expected to grow fast to almost double in 2020 if underlying network technologies are not significantly improved.

### Scope

### a. Research & Innovation actions:

Proposals are expected to cover one or both of the themes identified below, but not necessarily both of them.

**Focus on optical networks** - The target is to address i) the lack of dynamic control and management of optical network resources within and across operator's domains for lower cost and more flexible use of resources; ii) the ubiquitous delivery of very high speed access at 10 Gbps per user within 10 years and 100 Gbps later (including visible light communication); iii) the architectural limitations of inter and intra datacenter connectivity; iv) the limitations of current optical transmission technologies. Attention must be given to ensuring compatibility with legacy infrastructures and access unbundling regulation as well as to cost- and energy-efficiency.

**Focus on wireless networks** - It addresses the lack of dynamic control of wireless network resources through disruptive new "femtocell" like paradigms where end-users play the role of “prosumers” of wireless connectivity. Optimised spectrum use; energy efficiency and new usages are targeted. More flexible use of spectrum may be addressed from an architectural perspective including cognitive radio and spectrum aggregation, usage of higher bands up to 90 GHz, advanced modulation and coding, adaptive beam forming techniques. Hybrid combination of terrestrial and satellite infrastructures to address complete coverage, optimised spectrum use and network resilience are also in scope.

### b. Support actions

Production of technological roadmaps, support dissemination (including the yearly domain conference) and standardisation in the wireless/optical domains, support the integration of results coming from the various projects to provide an overall programme view, support liaison with related international activities, support the elaboration of research, operational and economic metrics in the target domains, and explore demonstrations and validation strategies for the objective.

### Expected impact

### Research & Innovation actions

- Maintain a state of the art industrial capability on optical network technology in Europe with at least 20% of the global market share.
- Diversify the strong European capabilities in wireless systems through emergence of novel technologies and spectrum usage patterns.

[13] COM(2012) 478 final

- Support the cost efficient emergence of novel classes of network services and applications by avoiding the "capacity crunch".
- Reduce energy consumption of basic infrastructures by a factor of about 10.
- Decrease spectral radiation exposure through low EMF technologies.
- Move beyond 10 Gbps per user within 10 years and 100 Gbps per user in a farther future over fixed accesses.
- Support metro and core networks with Pb/s throughput and Tb/s interface speeds.
- Enable managed and automated cross domain optical resources and foster emergence of industry open standards.
- Reach higher spectrum efficiency, target 10 fold increase.
- Enable new applications through spectrum efficient use of higher frequency bands little used today.
- Achieve ubiquitous access to critical/societal applications.
- Ensure availability of new interoperability open standards for wireless and optical communications and associated SEP (standard essential patents). US, Japan and Korea may be considered as priority countries where international cooperation may be achieved on a win-win basis.

**Support actions**

- Wide dissemination of results, constituency building and maintaining a programme view of the area including complementarity with relevant actions supported at Member States and Associated Countries level.

**Types of action:**

a. Research & Innovation Actions – Proposals requesting a *Small contribution* are expected

b. Coordination and Support Actions

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

# ICT 3- 2014: Advanced Thin, Organic and Large Area Electronics (TOLAE) technologies

## Specific Challenge:

TOLAE is an emerging technology and is the basis for advanced products in large area electronics that are thin, light weight, flexible and/or stretchable, suitable for large market sectors such as the textile, automotive, health, paper, plastic, advertising or construction industries.

Today however, most of the existing products are limited in functionality and performance and are suitable only to a few niche markets. Further efforts are needed to address the main technology barriers of TOLAE, in particular the lack of more efficient and stable materials and of more complex TOLAE circuitry and functionalities. The performance of components and the integration level should also be increased, connectivity should be enhanced and the route to manufacturability improved in terms of reproducibility and yield. Overall, the TOLAE value chain needs to be further developed and become more application-driven while paying attention to recyclability issues.

## Scope:

### a. Research & Innovation Actions[14]

To advance the state of the art of TOLAE technologies and manufacturing processes and increase the performance, functionality and complexity of TOLAE devices suitable for smart systems. Focus is on conformable/flexible/stretchable substrates and on the development of advanced material, technologies and scalable manufacturing processes for achieving more functionality, better performance, longer lifetimes, higher mobility/conductivity, more uniformity and better encapsulation of TOLAE devices.

Actions may include related work on design tool development, modelling and design styles/rules. They could also include hybrid integration of micro/nano-electronics, photonics and organic electronics or specific needs for fibre and textile electronics.

All actions should demonstrate strong industrial and user commitment and be driven by user requirements. They should include standardisation, validation of results for the target applications and address the supply chain, as appropriate.

b. Innovation Actions[15]

To develop and demonstrate novel, innovative products enabled by TOLAE technologies in smart packaging, advertisement and sensing by using suitable manufacturing options (sheet-to-sheet and/or roll-to-roll, printed and/or deposited) with the right balance between performance and volume. Each action should build a dedicated innovation value chain (preferably covering the full value chain). Proposals should contain prototype development and demonstration and may include small scale pilot manufacturing

All actions should be driven by concrete business cases, and by a thorough attention to user needs and target medium- to high-volume markets. They should include business plans for the targeted products with strong commitment to industrialise and manufacture them in Europe[16].

c. Technology Take-up and Innovation Support actions

Access services[17] to industry, enabling the wider adoption and deployment of TOLAE technologies in innovative products, in particular by SMEs and driven by concrete user requirements and business cases. The action

[14] Research & Innovation actions on OLEDs are addressed under ICT 29 as a joint LEIT ICT and NMP action.

[15] Manufacturing of predominantly OLED products is addressed under ICT28.

[16] *Wherever appropriate, they could seek synergies and co-financing from relevant national / regional research and innovation programmes, e.g. structural funds addressing smart specialisation. Actions combining different sources of public financing should include a concrete financial plan detailing the use of these funding sources for the different parts of their activities*.

should be led by the TOLAE excellence centres and innovation clusters. It could include activities for improving skills development in TOLAE and for promoting TOLAE to young people, entrepreneurs and the general public.

Close synergies should be sought with existing similar actions and regional / national research and innovation strategies for smart specialisation.

d. Innovation support through pre-commercial public procurement actions

Enabling the take-up and deployment of electronic and photonic textile technology developments for health care applications.

### Expected impact:

#### a. Research & Innovation Actions

- Reinforced industrial leadership in advanced TOLAE technologies and products addressing high-impact, high-volume applications.
- Demonstrable break-through innovations in TOLAE functionality or performance and/or in TOLAE manufacturability with high reproducibility and yield.
- Improved business opportunities and value creation in Europe by reinforced cooperation along the value chain.

#### b. Innovation Actions

- Effective market introduction of new and highly competitive TOLAE products targeting high impact markets/applications in smart packaging, advertisement and sensing.
- Overcoming the "valley of death" and building advanced manufacturing capabilities and first exploitation opportunities in Europe.

#### c. Technology Take-up and Innovation and support Actions

- Reinforced innovation effectiveness of TOLAE excellence centres and innovation clusters in particular towards SMEs.
- Broad take-up of TOLAE technologies in innovative products by at least 40 SMEs substantially improving their innovation capacity and time-to-market and with demonstrable revenue growth.
- Increased awareness and education and training skills in TOLAE.

#### d. Innovation support through pre-commercial public procurement actions

Wide diffusion of innovative and cost-effective electronic and photonic textile technology developments by pre-commercial procurement at the hospital or the point of care, enabling significant patient's care improvement while boosting productivity and employment

### Types of action:

a. Research & Innovation Actions – Proposals requesting a Small contribution are expected

b. Innovation Actions – Proposals requesting a Large contribution are expected

c. Research & Innovation Actions – One proposal requesting a Small contribution is expected to be selected

d. Pre-Commercial Procurement (PCP) Cofund actions; any remaining funds will be transferred to types of action a and b.

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

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[17] *Access services provide fast access to knowledge, training, prototyping, testing, manufacturing, design or engineering services for first users and early adopters, in particular SMEs.*

## ICT 10 -2015: Collective Awareness Platforms for Sustainability and Social Innovation

### Specific Challenge:

The challenge is to harness the collaborative power of ICT networks (networks of people, of knowledge, of sensors) to create collective and individual awareness about the multiple sustainability threats which our society is facing nowadays at social, environmental and political levels. The resulting collective intelligence will lead to better informed decision-making processes and empower citizens, through participation and interaction, to adopt more sustainable individual and collective behaviours and lifestyles.

The challenge includes the deployment at larger scales of digital social platforms for multi-disciplinary groups developing innovative solutions to societal challenges

### Scope:

a. Collective awareness pilots for bottom-up participatory innovation paradigms

Proposals are expected to develop and test pilot solutions to clearly defined sustainability challenges by harnessing 'network effects', leveraging on innovative combinations of distributed social networks, sensor networks and knowledge co-creation networks. Such scalable experiments and prototypes are expected to gain evidence and better understanding on the processes about collective awareness.

These pilots should be grounded on recent developments in open data, open source, distributed social networking and open hardware. Pilots must seize the full potential of existing mobile communications, integration of networks and online collaboration and can make use of innovative integrated mobile sensing devices to create collective awareness of risks and opportunities. They can pioneer crowdsourcing/crowdfunding solutions and new mechanisms for social innovation whose expected return goes beyond GDP measures and traditional success indicators[18].

Pilots should be user-driven, involving existing communities of people, and possibly addressing a combination of sustainability areas. Participants should include not only industry and academia but also local communities, grassroots activists, hackers, social entrepreneurs, students, citizens, creative industries and civil society organisations.

Consortia are expected to be multidisciplinary in nature: participation of at least two entities from domains different than ICT technologies (e.g. social sciences, psychology, economy, art, etc.) is required.

Given their piloting nature, proposals are expected to be rather compact and small, even though projects including technology development and/or integration may require larger investments.

b. Multidisciplinary research on collective awareness platforms (Internet Science)

Multidisciplinary research and development proposals will provide a better understanding of the obstacles and opportunities which are fundamental to the development of collective awareness platforms.

Areas of research include but are not limited to the motivations and incentives for online collaboration, the impact of extended awareness and peer pressure in driving more sustainable behaviors, defining online reputation mechanisms, and facilitating policy and technological developments addressing identity, anonymity, ethics, (user-centric) privacy preservation, monitoring of network neutrality, non-discriminatory access, collective governance (including Internet governance), new economic and value creation models beyond GDP, quality requirements for user-generated knowledge, visualization of social interactions and trends.

Attention should also be paid on how to manage online communities in smart manners, in order to extract a "wisdom of the crowds" which appropriately takes into account the individual knowledge ability in specific fields.

Consortia are required to include at least two entities from domains different than ICT technologies.

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[18] Concrete examples of areas and topics can be found at http://ec.europa.eu/digital-agenda/en/collectiveawareness."

c. Digital Social Platforms (DSP)

Digital Social Platforms will facilitate the transposition of existing or emerging participative and inclusive societal solutions to larger transnational scales through:

engagement of additional stakeholders so far excluded from the innovation process (removing barriers for users at risk of exclusion and for those who consider themselves unsuited for participation),

creation of concrete incentives for cooperation across countries and across domains, and

raising awareness, at societal, political and technological levels, about the effectiveness and best practices of such solutions.

They can build on established and open multi-stakeholder networks and communities, such as European Innovation Partnerships, and apply a suitable ICT-enabled cooperative environment to support their expansion and governance, accelerating knowledge creation and innovation. Work should address bottom up innovation activities.

Proposals must address critical factors for successful demand-driven societal innovation, including new collaborative business models across established disciplines and borders. Findings should be transferable and scalable to other communities in different domains and societal challenges.

d. Coordinating pilots and research activities in CAPs

The aim is to support and coordinate experimental and scientific activities in this field, to compare approaches and distil best practices, involving and networking stakeholders from a rich variety of application areas and disciplines, and bridging real world community-driven pilots of digital social platforms with multidisciplinary research (e.g. Internet Science).Expected impact:

**At innovation level:**

- Demonstration of the effectiveness, compared to existing solutions, of new bottom-up, open and distributed approaches exploiting network effects;
- Pioneering new promising models of participatory innovation based on open software, open data and open hardware.
- Capability to reach a critical mass and to transpose the proposed approach to other application areas related to sustainability;
- Effective involvement of citizens and relevant (and new) actors, as well as establishment of durable interdisciplinary collaborations in concrete application areas related to sustainability. Qualitative and quantitative indicators should be made available.
- Definition of new concepts and models for the development of digital social platforms, as well as its applicability to societal challenges and deeper understanding of social innovation processes.

**At scientific level:**

- Evidence based understanding of the techno-social issues related to key aspects of the networked society; this impact can be amplified by the public availability of (privacy respecting) data collected in field trials organised by the pilots;

**At societal/social innovation level:**

- Demonstrating how collaborative concepts based on the Internet can offer solutions to societal and sustainability challenges, by making use of commons, collective problem solving, knowledge sharing, social exchange and community-wide participation at local and global scale;
- Achieving in the longer term the active citizen participation in decision making, collective governance (including global Internet governance), self-regulation, new business and economic models. Collective awareness research is expected to demonstrate scalability, reusability of results and general applicability of proposed solutions at local or regional level;

- (only for objective c:) Transferability and scalability of the digital social platforms model, as well as of the services developed, to enlarged communities across borders: assessment of potential for replication, recommendations for effective scaling-up of social innovation activities;
- Measurable improvement in cooperation among citizens, researchers, public authorities, private companies, non-profit, non-governmental and any other civil society organisation in the development of new sustainable production and consumption patterns, new lifestyles, and innovative service creation and information delivery.

**Types of action:**

a. Research & Innovation Actions – The Commission considers that proposals requesting a contribution from the EU between EUR 0.5 million and EUR 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.

b. Research & Innovation Actions – Proposals requesting a Small contribution are expected

c. Research & Innovation Actions – Proposals requesting a Small contribution are expected

d. Coordination and Support Actions

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

## ICT 12 – 2015: Integrating experiments and facilities in FIRE+

The validation of research results in large-scale, real life experimental infrastructures is essential for the design and deployment of products, applications and services on the Future Internet. There is a need for more experimentally-driven research, which can be served well on top of available infrastructures.

### Scope:

**a. Research & Innovation Actions**: proposals are expected to cover one or more of the themes identified below, but not necessarily all of them.

- Proposals for the integration of experimental facilities, testbeds and laboratories into FIRE+. The resulting experimental infrastructure must be extensive, span various technologies and allow for integration on demand in response to experimenters' and users' needs.
- Collaborative projects for experimentally-driven research on top of existing experimental infrastructures including necessary extensions, adaptations or reconfigurations that serve the experiments. Proposals in any of the areas under point a. of topic FIRE+ are encouraged.

The action may involve financial support to third parties in line with the conditions set out in Part K of the General Annexes. The consortium will define the selection process of additional users, experimenters and suppliers for which financial support will be granted (typically in the order of EUR 50.000 – 150.000[19] per party). At least 50% of the EU funding should be allocated to this purpose.

**b. Innovation Actions**

Proposals for technically mature experiments on top of FIRE+ facilities for close-to-market products, applications or services. Proposed collaborative projects must include at least one SME and should be conducted with financial or other support and/or participation of a European or a National Agency; they must have a clear innovation and business perspective (e.g. based on new business models, including SMEs and start-ups).

### Expected impact:

A set of more than ten open, experimental facilities and platforms developed at European, national or regional level and integrated into a reliable, diversified experimental infrastructure, covering different aspects of advanced networking and applications. These facilities may include ecosystems and real world settings in experimental activities.

Further economies of scale in terms of infrastructure and its management by promoting the utilization of existing shared experimental facilities and platforms by experiments in this specific challenge.

Enabling access to FIRE facilities by SMEs; serving new constituencies and new types of innovation-oriented experimentation previously not served within FIRE+.

Promotion of innovative applications and services, close-to-market, short-term, focused, mature ideas and acceleration of technology take-up and transfer.

### Types of action:

a. Research & Innovation Actions – Proposals requesting a Small contribution are expected

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

[19] In line with the Rules for Participation Article 19 (7) the amounts referred to in Article 137 of the Financial Regulation may be exceeded where it is necessary to achieve the objectives of the action. b. Innovation Actions – Proposals requesting a Small contribution are expected

## ICT18-2014: Support the growth of ICT innovative Creative Industries SMEs

### Specific Challenge:

SMEs represent 85% of all actors in the creative industry sector. They co-exist with global players and often face difficulties in adopting state of the art ICT technologies and accessing finance. Moreover, they operate on fragmented and localized target markets and have to bear high market costs which affect their international competitiveness. In this context, ICT tools and technological innovation are fundamental for the creative industries and their competitiveness. They widen creative possibilities and improve efficiency in all sectors.

The goal is to increase the competitiveness of the European creative industries by stimulating ICT innovation in SMEs, by effectively building up and expanding a vibrant EU technological ecosystem for the creative industries' needs and by fostering exchanges between the creative industries SMEs and providers of ICT innovative solutions.

### Scope:

The scope is to stimulate the adoption and deployment of innovative ICT solutions by the creative industries SMEs. This can be achieved through collaboration with ICT providers and by accelerating and supporting the growth of European creative industries. The topic should be addressed by the following actions:

**a. Innovation Actions** to support the creative industries SMEs in leveraging emerging ICT technologies (e.g. 3D, augmented reality, advanced user interfaces, visual computing) for the development of innovative products, tools, applications and services with high commercial potential. Beyond the driving participation of creative industry SMEs and the participation of ICT technology providers, the involvement of research and innovation centres is encouraged. Proposals should be clearly driven by user-needs and demonstrate the market demand for the solution and the innovation potential. Solutions should be cost-effective, market-ready and target international markets.

**b. Coordination and Support Actions** to stimulate the growth of European creative industries exploiting advanced ICT for the development of new products and services and ICT SMEs innovating in the field of creative industries. Activities should:

- include, where beneficial, investor readiness support (e.g. explaining investors' requirements, assisting in the development of business plans …).

- connect creative industries SMEs with appropriate sources of funding (e.g. loans, venture capital, business angels investment, crowd-funding …) and with international business networks.

- increase the market access of creative industries SMEs across borders.

The proposals should encompass a broad geographical coverage, stimulating innovation not only in the leading regions of Europe.

### Expected impact:

#### a. Innovation Actions

- Tens of innovative solutions with high market potential ready to be deployed by European creative industries SMEs.
- Stronger collaboration between ICT innovative technologies providers and creative industries SMEs to improve the competitive position of the European creative industries.

#### b. Coordination and Support Actions

- An established sustainable network of ICT-driven innovation multipliers active in the creative industries sectors with proven record of stimulating innovation.
- Tens of examples of fruitful business relations enabled by the network.

### Types of action:

- **a. Innovation Actions** – The Commission considers that proposals requesting a contribution from the EU between EUR 0.5 million and EUR 1 million for a period between 6 and 18 months would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts or duration.
- b. Coordination and Support Actions
- The conditions related to this topic are provided at the end of this call and in the General Annexes.

## ICT19-2015: Technologies for creative industries, social media and convergence.

### Specific Challenge:

The demand is growing for high-quality content and new user experiences. At the same time, thanks to ubiquitous technology adoption, widespread use of mobile devices, broadband internet penetration and increasing computing power the consumption of content anywhere, anytime and on any device is becoming a reality. Consequently, developments related to content creation, access, retrieval and interaction offer a number of opportunities and challenges, also for the creative and media industries. In order to keep pace with the trends and remain competitive, those industries need to explore new ways of creating and accessing content. The opportunity to establish new forms of content and user engagement could be transformative to many businesses in creative and media industries.

### Scope:

The focus is on research, development and exploitation of new or emerging technologies (e.g. 3D and augmented reality technologies) for digital content creation to support the creative and media industries and for unlocking complex information and media and interacting with them. The topic will be addressed by the following actions:

**a. Research & Innovation Actions**; Research in new technologies and tools to support creative industries in the creative process from idea conception to production. The proposed tools should explore the potential of technology to enhance the human creative process from the expression of ideas to experiment solutions. Where possible, collaboration and user-community interaction should be improved based on research leading to a deeper understanding of the dynamics of co-creative processes. The tools should be cost effective, intuitive, and be demonstrated in real-life environments relevant for the creative industries (such as advertising, architecture, arts, design, fashion, films, music, publishing, video games, TV and radio).

**b. Innovation Actions**; Demonstration of the viability of new technologies and validation of innovative solutions through large scale demonstrations, pilots or testing of use cases so as to guarantee sustainable deployment that facilitate convergence and integration between broadcasting, broadband Internet-based services, audio-visual and social media. Multimodal and multidisciplinary approaches for searching technologies responding to the new demands from the content side (3D, user-generated, real-time media, social media,…) and from the user context (context-centric, semantic, relevant community feed-back,…).

This also includes new forms of experiencing environments (immersive, surrounding, multisensory and interactive, in any device, always connected).

**c. Coordination and Support Actions on Convergence and Social Media**

- Facilitate research and policy exchange in Convergence and Social Media: increased awareness of latest technological developments and research results among policy stakeholders and increased awareness of current and future policy and regulatory framework among researchers.
- Support R&D programmes/activities, dissemination of results and organisation of scientific and/or policy events in Convergence and Social Media. Analysis and development of research agendas and roadmaps, pre-standardisation initiatives and stakeholder coordination in Convergence and Social Media

### Expected impact:

**Research & Innovation Actions**

- Validated novel ICT technologies and tools supporting the creation process and delivering measurable benefits for the creative industries as regards time and resource investment, and quality of output.

**Innovation and Support Actions**

- Development of new services as a consequence of the convergence of broadband, broadcast and social media.

- Further development of user experience in immersive environments and social media, especially in any device and mobile environments.

**Types of action:**

a. Research & Innovation Actions – Proposals requesting a Small contribution are expected

b. Innovation Actions – Proposals requesting a Small contribution are expected

c. Coordination and Support Actions

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

## ICT22-2014: Multimodal and Natural computer interaction

### Specific Challenge:

As devices and systems are becoming increasingly powerful, the interface between human and computer is often lagging behind and constitutes a bottleneck for seamless and efficient use. Leveraging on multidisciplinary expertise combining knowledge from both the technological and human sciences, new technologies need to offer interactions which are closer to the communication patterns of human beings and allow a simple, intuitive and hence more "natural" communication with the system.

### Scope:

The topic will be addressed by the following focused actions:

**a. Research & Innovation Actions:** Provide interactive information retrieval systems with more efficient and natural ways of delivering answers to users' queries especially in unexpected and/or difficult circumstances. This should be supported by research on knowledge-based autonomous human-like social agents that can handle and learn from conversational spoken and multimodal interaction as well as react proactively to new communicative situations. Systems should cope with spontaneous spoken dialogue and gestural interaction, in multiple languages, and exhibit adequate communicative, conversational, affective and social capabilities in relation to the domain/task under consideration and the needs and abilities of the user. Technologies should be designed to match multiple delivery platforms and be demonstrated in real environments, while research is expected to be based on and/or produce freely available and re-usable resources.

**b. Research & Innovation Actions**: Develop novel multi-modal, adaptive interfaces, including Brain Computer Interfaces, assisting people with disabilities. Research should explore: how users interact and cooperate with (intelligent) systems, including user modelling aspects for the identification of necessary abilities for different functions and environments; how to detect behaviours, emotions and intentions of the user; how to sense and understand the environment and other context factors; how multimodal (including nonverbal) interaction is used in ambient environments. Activities may cover also interoperability standards (for software and devices) as well as interaction and cooperation between machine intelligence in environments and human intelligence.

**c. Innovation Actions**: Develop and validate innovative multimodal interfaces to provide more efficient and natural ways of interacting with computers and improve users' experience. Leveraging on one or multiple smart devices and sensors with capabilities such as scene analysis, voice recognition, human position, gestures and body language detection capabilities, such systems must provide non-intrusive interaction with human where real and virtual content are blended. Built with a user centric approach, solutions should be cost effective; address clear market needs and be validated in domains such as those of the creative industries fields.

### Expected impact:

**a. Research & Innovation Actions**

- Improve multilingual speech processing and bridging the gap between recognition and synthesis, exploiting metadata and other contextual data.
- Increase the automatic inferences capacities from rich context thanks to improved language understanding, sensed environments/objects, use of social media and agent's experience.

**b. Research & Innovation Actions**

- Advance the capacity of human-machine interaction technologies to enable disabled and elderly people to fully participate in society.

**c. Innovation Actions**

- Enable better uses of ICT technologies within the creative industries by providing directly usable solutions addressing their specific needs.
- Provide a large spill over of the knowledge acquired to a maximum of European industries.

- Improve the competitive position of the European industries through the provision of cost effective, innovative and high-value products and services.

**Types of action:**

a. Research & Innovation Actions – Proposals requesting a Small contribution are expected

b. Research & Innovation Actions – Proposals requesting a Small contribution are expected

c. Innovation Actions – Proposals requesting a Small contribution are expected

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

# ICT 26-2014: Photonics KET

## Specific Challenge:

Europe's photonics industry is facing fierce global market competition and has to cope with a very high speed of technological developments in the field. Further major S&T progress and research and innovation investments are required for sustaining Europe's industrial competitiveness and leadership in photonic market sectors where Europe is strong (communications, lighting, laser-based manufacturing, medical photonics, or safety & security) and to exploit new emerging market opportunities.

Moreover, Europe is experiencing the existence of many fragmented and rather uncoordinated developments between many different national and regional players. Europe suffers also from a slow innovation process for turning many good R&D results achieved into innovative products ('Valley of Death'). Finally, Europe needs to better exploit the large enabling potential of photonics in many industrial sectors and in solutions addressing major societal challenges such as health and well-being, energy efficiency or safety.

## Scope:

### a. Research & Innovation Actions

Application driven core photonic technology developments for a new generation of photonic devices (including components, modules and sub-systems): Actions should also address the related materials, manufacturability, validation of results for the target applications, and standardization activities, as appropriate. They should demonstrate strong industrial commitment, be driven by user needs and concrete business cases supported by strong exploitation strategies, and cover the value/supply chain as appropriate. Focus is on the following topics:

- **Biophotonics** for screening of diseases: Mobile, low-cost point-of-care screening devices for reliable, fast and non- or minimally-invasive detection of diseases (such as cardiovascular, cancer, neurodegenerative, skin or lung diseases, etc.). Actions should be driven by medical end-user needs and include a validation in real settings. Clinical trials are excluded.
- **Sensing for safety and civil security:** Breakthrough advances in cost-effective, high-performance, multi-band optoelectronic devices (including sources) for near- and mid-infrared sensing applications (spectral range of 0.7 to 50 µm) representing high-volume markets. Device cost in volume production should not exceed 10 times the related cost of devices for the visible domain.
- **Disruptive approaches in sensing**: Proof-of-concept for photonic sensing devices offering breakthrough advances in sensitivity or specificity enabled by new technology, new device concepts (e.g. based on quantum optics or quantum technologies, plasmonics, metamaterials, or non conventional wavefront shaping), new materials or non-conventional light-matter interaction from the research lab. Actions should demonstrate the feasibility of industrially relevant devices through a functional prototype.

### b. Innovation Actions

Open system architectures for Solid State Lighting (SSL): Development and validation in real settings of new open system architectures (hardware and software level) for SSL based intelligent lighting systems. Actions should address specific lighting requirements in relation to the intelligent system control network, cost-effective installation (easy commissioning), safety and security issues, as well as the development of related electronic/photonic devices. Proposed architectures should allow interchangeability of the lighting modules with focus on the standardisation of interfaces. Actions should involve microelectronic and SSL manufacturers or suppliers and include strong commitment for industrialising targeted products in Europe.

### c. Coordination and support actions

Actions driven by the key stakeholders in photonics and targeting:

- Strategic coordination and networking of Photonics21 stakeholders and other relevant communities for strategic technology road-mapping and for coordination with national and regional photonics activities.

- The wide uptake of SSL technologies[20]: Bringing together European cities to share information, testing facilities and procurement and deployment experiences on SSL; networking European SSL test facilities to ensure LED product quality in the European market place; training the public procurers in SSL technologies.

- EU-wide outreach for promoting photonics to young people, entrepreneurs and the general public.

**d. ERA-NET Cofund Action**

A joint call for proposals on a photonics topic of strategic interest, to be funded through an ERA-NET Cofund action between national and regional grant programmes.

## Expected impact:

**a. Research & Innovation Actions**

For application driven core photonic technology developments:

- Secured and reinforced industrial technology leadership and substantially increased market presence in diagnostics and in safety & security.
- Improved business opportunities and value creation in Europe by reinforced cooperation along the value chain.
- Substantially improved screening of diseases for a more effective treatment.
- Substantially improved sensing solutions for high-volume safety and security markets.

For disruptive approaches in sensing:

- Secured industrial technology leadership in novel sensing systems targeting applications of high industrial and/or societal relevance.

**b. Innovation Actions**

- Reinforced industrial leadership in intelligent lighting systems and related devices fabricated in Europe.
- Major benefits for the users through the wide market introduction of intelligent lighting systems based on open system architectures and standardised interfaces.

**c. Coordination and support actions**

- Reinforced value chains and deployment of photonics technologies by closer cooperation of key photonics stakeholders and users in areas of common interest.
- Demonstrable improvement of awareness, and support of/for EU cities for widely deploying solid-state lighting with measurable benefits for the citizens.
- Demonstrable increased awareness and recognition of photonics by the wide public.

**d. ERA-NET Cofund action**

- Closer cooperation and greater pooling of resources between regional, national and EU-wide research programmes in strategic photonics Research & Innovation areas.

## Types of action:

- a. Research & Innovation Actions – Proposals requesting a Small contribution are expected
- b. Innovation Actions – One proposal requesting a Large contribution is expected to be selected
- c. Coordination and Support Actions
- d. ERA-NET Cofund Action, any remaining funds will be transferred to action type a. above.
- The conditions related to this topic are provided at the end of this call and in the General Annexes.

[20] *These actions are in line with the Green Paper "Lighting the Future", COM(2011) 889 final.*

# ICT 27-2015: Photonics KET

## Specific Challenge:

Further major S&T progress and R&I investments are required for sustaining Europe's industrial competitiveness and leadership in photonic market sectors where Europe is strong. Europe needs also to strengthen its manufacturing base in photonics to safeguard the further potential for innovation and value creation and to maintain jobs. Finally, Europe needs to better exploit the innovation capacity of the more than 5000 existing photonics SMEs and the innovation leverage potential of the more than 40 existing innovation clusters and national platforms

## Scope:

**a. Research & Innovation Actions**

**Application driven core photonic technology developments** for a new generation of photonic devices (including components, modules and sub-systems). Focus is on the following topics:

- **Optical communication for data centres**: Low-cost, energy-efficient photonic devices supporting radically new system and network architectures driven by the emergence of exa-scale cloud datacentres. Actions should focus on optical inter- and intra-data centre transmission, switching and interconnects facilitating Tb/s interface speeds and Pb/s network throughput.

- **High-throughput laser-based manufacturing**: High-power, high-efficiency laser sources (both continuous wave and pulsed); novel technologies and devices for beam delivery and for processing of multiple beams from laser source arrays; high-performance optical devices and systems; fast synchronisation of laser source and high-speed scanning devices.

**PIC technology**: Device, circuit and fabrication technology for PICs (Photonics Integrated Circuits), suited for cost-effective volume manufacturing on semiconductor or dielectrics based photonic integration platforms. Actions may cover also electronic-photonic integration, as well as heterogeneous and hybrid integration technologies for PIC-based high-performance or high-density modules.

All RTD actions should address also the related materials, manufacturability, validation of results for the target applications, and standardisation activities, as appropriate. They should demonstrate strong industrial commitment, be driven by user needs and concrete business cases supported by strong exploitation strategies, and cover the value/supply chain as appropriate.

**b. Innovation support through public procurement actions**[21]

Pilot deployment of software-defined optics in backbone networks: Equip the networks of Public network operators (e.g., NRENs) with novel Software Defined Optical Networking technologies (from component level to system and network level) using first commercial hardware and software to transport high traffic volumes to demanding customers in a dynamic way.

**c. Coordination and Support actions**

Actions driven by the key stakeholders in photonics and targeting:

- Open access of Researchers and SMEs to advanced design, fabrication and characterization facilities fostering the development of novel photonics solutions through the use of new materials, unconventional approaches and light-matter interaction.

[21] *Wherever appropriate, actions could seek synergies and co-financing from relevant national / regional research and innovation programmes, e.g. structural funds addressing smart specialisation. Actions combining different sources of financing should include a concrete financial plan detailing the use of these funding sources for the different parts of their activities.*

- Cooperation of photonic clusters and national technology platforms to stimulate the innovation potential of SMEs, based on business cases demonstrating a clear potential for sales and deployment growth.

Actions should link with on-going support actions providing access to advanced R&I services and capabilities with the aim to make them also accessible to researchers or to establish a network of innovation multipliers providing a broader technological, application, innovation, and regional coverage of such services and capabilities in order to address the needs of SMEs.

**d. ERA-NET Cofund action**

A joint call for proposals on a photonics topic of strategic interest, to be funded through an ERA-NET Cofund action between national and regional grant programmes.

## Expected impact:

**a. Research & Innovation Actions**

- Improved business opportunities and value creation in Europe by reinforced cooperation along the value chain.
- Secured and reinforced industrial technology leadership and substantially increased market presence in high-bitrate optical communications for data centres and in laser-based manufacturing of high-quality products.
- At least 10-factor reduction of power consumption and cost in communication technologies for (exa-scale) data centres.
- Significant productivity increase and substantial leverage effects to many industries using laser-based manufacturing.
- Measurable productivity increase in the manufacturing of complex PICs and sustained break-through innovations in new photonic products fabricated in Europe.

**b. Innovation support through public procurement actions**

- Faster and wider roll-out and deployment of software defined optical networking technologies and deployment of value-added services and applications in Europe.

**c. Coordination and Support actions**

- Demonstrable value generation of novel photonics approaches by researchers and SMEs through enhanced access to advanced fabrication and characterisation facilities.
- Reinforced innovation effectiveness of cluster networks in particular towards SMEs with measurable value creation for SMEs in terms of number of business collaborations stimulated, penetration of new markets and/or new application areas close to the market, etc.

**d. ERA-NET Cofund action**

- Closer cooperation and greater pooling of resources between regional, national and EU-wide research programmes in strategic photonics R&I areas.

## Types of action:

a. Research & Innovation Actions – Proposals requesting a Small contribution are expected

b. Public Procurement of Innovation (PPI) Co-fund actions; any remaining funds will be transferred to action type a. above.

c. Coordination and Support Actions

d. ERA-NET Cofund Action, any remaining funds will be transferred to action type a. above.

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

# ICT 28-2015: Cross-cutting ICT KETs

## Specific Challenge:

Europe is facing fierce global competition to maintain its technological leadership in KETs. However, while Europe has excellent R&D results in individual KETs, it often fails to turn those timely into highly innovative products. In particular, Europe fails to bring stakeholders from the different KETs together around new value chains and new business collaborations. These will create value above and beyond the mere addition of individual technologies and are essential for Europe to develop multi-disciplinary technological capabilities and bring into the market new, high value-added products that are manufactured in Europe. By investing more on innovation and in particular on KET deployment projects and integration platforms as well as on KET pilot lines, in particular around micro-nano-electronics, photonics and manufacturing, there will be a direct impact on Europe's global competitiveness – in particular for the SMEs – as well as on Europe's capability to offer new solutions for some of the major societal challenges it faces.

## Scope:

**a. Innovation Actions**

ICT-KET integrated platforms for the healthcare and food sectors: Further development and validation in real settings of reliable, low-cost micro-nano-bio and bio-photonics systems driven by users. Actions should target the health sector for early or fast diagnosis or monitoring of disease and patient status (clinical trials are excluded) or the food sector for quality, safety and process control. They should include substantiated business cases for the targeted products with strong commitment to industrialize them in Europe.

**b. Pilot lines for advanced KET products**

Set-up and validation of pilot production for advanced products. Actions may include also the development of fabrication processes, process qualification, and further process engineering. They should be open access and be driven by the key stakeholders able to set-up and run such pilot lines. Proposals should also include business plans for the further industrialization of the production processes and, if applicable, for specific planned products, with strong commitment to manufacturing in Europe[22]. Actions should address the following topics:

- Pilot line for OLEDs on flexible substrates: Focus is on introducing volume fabrication (sheet to sheet, roll to sheet and roll to roll) of reliable OLEDs on flexible substrates with low material utilization. Actions may include also the upgrading of current research pilot lines.
- Pilot line for analytical mid-infrared (MIR) micro-sensors: A pilot line providing foundry services targeting in particular SME needs. Focus is on fabricating processed wafers and mounted / packaged chips for MIR micro-sensor systems addressing high-impact applications, and introducing lower-cost, more reliable and efficient MIR materials in the fabrication process. Open access should be facilitated through appropriate support services and tools, to be validated through pre-commercial pilot runs for external users.
- Pilot line for PIC fabrication on III-V and/or dielectric based platforms providing foundry services for the fabrication of complex PICs (Photonic Integrated Circuits) based on generic fabrication processes. The foundry offer should meet in particular the needs of SMEs. Open access should be facilitated through appropriate support services and tools (e.g. design support, design kits and tools; PIC characterisation and packaging). The foundry offer should be validated through pre-commercial pilot runs for external users.

**c. Coordination and Support actions**

Cooperation of scientists, technology developers and providers, and end users for accelerating the deployment of bio-photonics and micro-nano-bio solutions in the health sector.

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[22] *Wherever appropriate, actions could seek synergies and co-financing from relevant national / regional research and innovation programmes, e.g. structural funds addressing smart specialisation. Actions combining different sources of financing should include a concrete financial plan detailing the use of these funding sources for the different parts of their activities.*

## Expected impact:

**a. Innovation actions**

- Measurable progress in the effectiveness, cost-performance and speed of medical diagnosis, the monitoring of disease and patient status, the prevention and treatment of major diseases and/or the quality controls in the food sector.
- Wide market introduction of micro-nano-bio and bio-photonics systems for healthcare and food quality, safety and processing.

**b. Pilot lines for advanced KET products**

- Cost-performance breakthroughs for OLEDs, making OLED competitive with existing LED based solutions; for reliable MIR sensing products; or for reliable PIC fabrication.
- Effective market introduction of new and highly competitive OLEDs and MIR sensing products.
- Measurable productivity increase in PIC manufacturing; and, measurable new, high added-value product propositions in a wide range of photonics market segments enabled by advanced manufacturing capabilities and/or added value services in PICs.
- Improved value creation in Europe through stronger value and supply chains involving relevant industrial stakeholders.

**c. Coordination and Support actions**

- Reinforced value chains and accelerated deployment of micro-nano-bio and bio-photonics solutions in the health sector through closer cooperation of the key stakeholders and users.

## Types of action:

**a. Innovation Actions**, TRL 5 and 6 (please see part G of the General Annexes) – Proposals requesting a Small contribution are expected

**b. Innovation Actions**, TRLs 5-7 (please see part G of the General Annexes). Minimum one pilot line per area is expected to be selected for funding. The Commission considers that proposals requesting a contribution from the EU of up to EUR 14 million each would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts

**c. Coordination and Support Actions**

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

## ICT 37 - 2014-15: Open Disruptive Innovation Scheme (implemented through the SME instrument)

### Specific Challenge:

The challenge is to provide support to a large set of early stage high risk innovative SMEs in the ICT sector. Focus will be on SME proposing innovative ICT concept, product and service applying new sets of rules, values and models which ultimately disrupt existing markets.

The objective of the ODI is threefold:

Nurture promising innovative and disruptive ideas;

Support their prototyping, validation and demonstration in real world conditions;

Help for wider deployment or market uptake.

Proposed projects should have a potential for disruptive innovation and fast market up-take in ICT.

In particular it will be interesting for entrepreneurs and young innovative companies that are looking for swift support to their innovative ideas.

The ODI objective will support the validation, fast prototyping and demonstration of disruptive innovation bearing a strong EU dimension.

### Scope:

ODI will be implemented through the SME instrument which consists of three separate phases and a coaching and mentoring service for beneficiaries. Participants can apply to Phase 1 with a view to applying to Phase 2 at a later date, or directly to Phase 2.

**In phase 1**, a feasibility study shall be developed verifying the technological/practical as well as economic viability of an innovation idea/concept with considerable novelty to the industry sector in which it is presented (new products, processes, design, services and technologies or new market applications of existing technologies). The activities could, for example, comprise risk assessment, market study, user involvement, Intellectual Property (IP) management, innovation strategy development, partner search, feasibility of concept and the like to establish a solid high-potential innovation project aligned to the enterprise strategy and with a European dimension. Bottlenecks in the ability to increase profitability of the enterprise through innovation must be detected and analysed during phase 1 and addressed during phase 2 to increase the return in investment in innovation activities. The proposal should contain an initial business plan based on the proposed idea/concept.

The proposal should give the specifications of the elaborated business plan, which is to be the outcome of the project and the criteria for success.

Funding will be provided in the form of a lump sum of EUR 50.000. Projects should last around 6 months.

**In phase 2**, innovation projects will be supported that address the specific challenge ODI and that demonstrate high potential in terms of company competitiveness and growth underpinned by a strategic business plan. Activities should focus on innovation activities such as demonstration, testing, prototyping, piloting, scaling-up, miniaturisation, design, market replication and the like aiming to bring an innovation idea (product, process, service etc) to industrial readiness and maturity for market introduction, but may also include some research. For technological innovation a Technology Readiness Levels of 6 or above (or similar for non-technological innovations) are envisaged; please see part G of the General Annexes.

Proposals shall be based on an elaborated business plan either developed through phase 1 or another means. Particular attention must be paid to IP protection and ownership; applicants will have to present convincing measures to ensure the possibility of commercial exploitation ('freedom to operate').

Proposals shall contain a specification for the outcome of the project, including a first commercialisation plan, and criteria for success.

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.5 and 2.5 million would allow phase 2 to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Projects should last between 12 and 24 months.

In addition, in phase 3, SMEs can benefit from indirect support measures and services as well as access to the financial facilities supported under Access to Risk Finance of this work programme.

Successful beneficiaries will be offered coaching and mentoring support during phase 1 and phase 2. This service will be accessible via the Enterprise Europe Network and delivered by a dedicated coach through consultation and signposting to the beneficiaries. The coaches will be recruited from a central database managed by the Commission and have all fulfilled stringent criteria with regards to business experience and competencies. Throughout the three phases of the instrument, the Network will offer to complement the coaching support by providing access to its innovation and internationalisation service offering. This could include, for example, depending on the need of the SME, support in identifying growth potential, developing a growth plan and maximising it through internationalisation; strengthening the leadership and management skills of individuals in the senior management team and developing in-house coaching capacity; developing a marketing strategy or raising external finance.

### Expected impact:

Enhancing profitability and growth performance of SMEs by combining and transferring new and existing knowledge into innovative, disruptive and competitive solutions seizing European and global business opportunities.

Market uptake and distribution of ICT innovations.

Increase of private investment in innovation, notably through private co-investments and/or follow-up investments in successfully supported SMEs.

The expected impact should be clearly substantiated in qualitative and quantitative terms (e.g. on turnover, employment, market seize, IP management, sales, return on investment and profit).

### Types of action:

SME Instrument (70%)

## FoF 1 -2014: Process optimisation of manufacturing assets

### Specific Challenge:

Today's manufacturing is increasingly challenged by uncertainties of continuously and rapidly -changing market conditions and increasingly shorter time-to-market requirements. Manufacturing value chains are distributed and dependent on complex information and material flow requiring new approaches inside and outside the factory both on process and product lifecycle level.

### Scope:

**R&I Actions:** proposals are expected to cover one or more of the themes identified below, but not necessarily all of them.

**CPS-based process optimisation (Cyber-Physical Systems)** for adaptive and smart manufacturing systems bringing together novel concepts for CPS, progress in advanced control and new modelling and simulation technologies.

- Methods for Integrative Control and Optimization of Discrete and Continuous Processes supporting engineers in their aim of detecting, measuring and monitoring the variables, events and situations which affect the performance, energy-use and reliability of manufacturing systems. Research should encompass progress in smart sensor technologies, smart system design, embedded systems and advanced control.
- Scalable CPS architectures for adaptive and smart manufacturing systems to dynamically enable the continuous design, configuration, monitoring and maintenance of operational capability, quality, and efficiency. Self-learning capabilities closing the feedback loop between production and design should be included as appropriate.

**Collaborative and mobile manufacturing:** Development of agile collaboration tools for process optimisation of manufacturing assets across the supply chain towards the Cloud-enabled Manufacturing Business Web. Research should address real-time architectures to master complexity of the supply network and underlying logistics resources.

**Towards zero-failure laser-based manufacturing:** Fast and accurate process monitoring systems allowing feedback control of laser process parameters in highly dynamic manufacturing processes. Actions should cover in particular the development of (in-line) process monitoring sensors, measurement and non-destructive testing tools including the related high speed data processing and reduction. Actions should include validation/demonstration elements and involve stakeholders covering the whole value chain.

#### a) Support Actions

Consensus building for a factory-wide interoperability framework for CPS engineering and manufacturing environments; concepts for a European smart specialisation strategy in manufacturing building on the model of virtual value chains; concept and roadmap building in relation to smart and safe workspaces for laser-based manufacturing.

### Expected impact:

- Increased capability for better and faster reaction to market changes by being able to use holistic global and local optimization algorithms in a collaborative value chain.
- Reduced complexity of production systems by at least an order of magnitude through an interoperable de-centralised architecture approach and interoperability frameworks.
- Productivity increase of about 30% through the enhanced utilisation of resources and information taking a holistic view in a collaborative value chain.
- Strengthened market position of European producers of laser-based manufacturing equipment, their suppliers and of the users of the equipment.
- Reinforced capacity to manufacture high-quality and innovative products and to penetrate new application areas.

**Types of action:**

- Research & Innovation Actions (100% funding)
- Coordination and Support Actions

## FoF 2 -2015: ICT-enabled modelling, simulation, analytics and forecasting technologies

### Specific Challenge:

Simulating continuous and discrete manufacturing processes, forecasting the behaviour of manufacturing systems and processes, and designing products to an even larger extent through virtual mock-ups integrated in the design and production chain are key enablers for Europe's future manufacturing sector. Advances in ICT in terms of high performance computing power and communication speed, smart sensor technologies for generating and exploiting "big data", the convergence of the embedded world and the Internet/Cloud world in cyber physical systems (CPS), multi-modal visualisation and interaction technologies, are leading to a new generation of modelling, simulation and forecasting methods and tools. These offer a huge potential for making the whole manufacturing chain more competitive.

### Scope:

**R&I Actions:** proposals are expected to cover one or more of the themes identified below, but not necessarily all of them.**Innovative modelling, simulation, analytics and forecasting tools for manufacturing at large**, building on advances in ICT. Projects should be driven by industrial use-cases and should include proof-of-concept demonstrations for validation. They should address as appropriate several of the following issues:

- Modelling and simulation methods involving multiple phenomena (physical, mechanical, energetic, chemical, energy, material characteristics, cost, …); including multi-scale and integrated discrete/continuous models and multidisciplinary design optimisation tools taking a holistic approach; and/or integrating virtual and physical experiments building on the combination of simulated, experimental, and real world data in real time.
- Integrated knowledge-based systems covering the complete product life-cycle with advanced analytics and self-learning capabilities exploiting the availability of "big data" from smart sensors, historical process files, or human-authored data; and addressing aspects like interactivity, real-time, data-fusion, advanced visualisation, security and privacy.

**Integrated modelling, simulation and information management systems** benefiting from recent advances in ICT. Projects are expected to stimulate pre-normative or standardisation activities related to aspects such as information/knowledge exchange, data sharing, semantic technologies, tool integration, etc. Projects must include reference implementations and demonstration and validation in minimum two comprehensive and complementary industrial use cases. Focus is on:

- Integrated information management systems for product-process-production systems that are well embedded into their social, environmental and economic context.
- Advanced computer aided technologies (CAx), modelling and simulation toolboxes tailored for novel manufacturing processes like laser-based and additive manufacturing.

**Support Actions**: Road mapping and constituency building for novel ICT-enabled concepts in manufacturing supporting the wide adoption of virtual, integrated, scalable, semantic factory models; merging design and production models; and integrating novel ICT for creativity. Stimulating EU-US collaboration on R&I related to modelling and simulation.

Expected impact:

- Increased productivity during design and ramp-up phases and for higher mass customization capacity for big enterprises as well as SMEs through access to on-demand scalable manufacturing services and through agreed data standards.
- Improved cost efficiency and accuracy, reliability and speed of simulation techniques for manufacturing processes and/or full complex products.
- Reduced time to production and optimised supply chains enabled by increased tool interoperability and data integration.

- Enhanced interoperability of integrated product and factory design systems and global state monitoring enabling new type of services related to the data analysis, simulations and visualization techniques in each manufacturing stage.

**Types of action:**

- Research & Innovation Actions (100% funding)
- Coordination and Support Actions

## FoF 3 -2015: ICT Innovation for Manufacturing SMEs (I4MS)

### Specific Challenge:

For Europe's competitiveness in manufacturing, it is crucial that advances in ICT are taken up in engineering and manufacturing "at large" as soon as they have the appropriate maturity level.

### Scope:

As Phase 2[23] of I4MS this objective addresses the adoption of the next generation of ICT advances in the manufacturing domain. Focus is on emerging innovative technologies and processes, which need to be customised, integrated, tested and validated before being released on the market. Special emphasis is on strengthening European SMEs along the value chain by adopting new concepts and business models based on servitisation, for product operation, or for end-of-life use.

Two types of **innovation experiments** are supported: Driven by the requirements of first-time users, **Application Experiments** bring together all actors of the value chain and experts necessary to equip new users with novel products or services and assist them in customising and applying these in their respective environments. In **Equipment Assessment Experiments,** suppliers of innovative high-tech equipment install and assess their prototypes or products in production-like environments and validate them in a manufacturing line or in an industrial environment that is very close to manufacturing conditions.

Activities are expected to be clustered in larger projects to achieve critical mass and to better exploit EU-added value. Common tasks include: targeted dissemination; management of calls for new actions; exploitation of synergies across actions. To better cope with the speed of innovation in ICT, implementation must be flexible and fast. Part of the actions and partnership are to be defined from the outset, while additional experiments or users, may be identified through open calls during the action (max. 50% of the total budget).

**a.** Three areas of technologies are targeted for the **Innovation actions**::

- Highly flexible and near-autonomous robotics systems (application experiments).
- HPC Cloud-based modelling, simulation and analytics services for modelling multiple interconnected phenomena; for integrating multiple tools across the process chain; for exploiting the dynamic availability of "big data"; for integrating novel mobile interfaces for data management and decision support; and/or for achieving real-time response (application experiments).
- Integration of Cyber-Physical-System modules in manufacturing processes and process chains (application or assessment experiments) to increase sophistication and automation in production SMEs and to create novel value added services linked to process surveillance and maintenance.

**b)Support actions**: network of Innovation multipliers leveraging investment in research and innovation is to be reinforced:

To advance the European I4MS **innovation ecosystem**: The aim is to achieve broad coverage in technological, application, innovation, and geographic terms. Its tasks and services shall include maintaining a single innovation portal for newcomers; sharing of best practices and experiences; dissemination; brokering between users and suppliers in view of open calls; leveraging further investment by stimulating replication, by brokering access to venture capital or other private investment, and by exploiting regional funds in the context of the European strategy on "Smart Specialisation".

### Expected impact:

- Attract a significant number of new users of **advanced ICT** in the **manufacturing sector**, in particular SMEs and the mid-caps.

[23] Information of Phase 1 available in http://cordis.europa.eu/fp7/ict/computing/home-i4ms_en.html

- More **innovative and competitive technology suppliers**, in particular SMEs, both on the level of ICT and on the level of manufacturing equipment, able to supply manufacturers with new equipment, components, and tools for improved manufacturing and engineering operations.
- More competitive **European service providers** through provisioning of new types of services; through strengthening the presence on local markets.
- Exploration of new application areas for advanced ICT in manufacturing at large.

**Types of action:**

- Innovation Actions (70% funding)
- Coordination and Support Actions

## FoF 4 -2015: Development of novel materials and systems for OLED lighting or displays

### Specific Challenge:

The further technological development of solid-state light sources (LEDs and OLEDs) and of energy efficient lighting systems is expected to give Europe a leading position on the world lighting market and create new manufacturing jobs for novel consumer products. Moreover, the move to solid-state lighting based on inorganic (LED) and organic (OLED) semiconductors constitutes an important factor in reducing the amount of electricity consumed by lighting and thus limiting carbon dioxide emissions. An important part of the research on lighting will also be relevant to advanced displays

### Scope:

**R&I Actions** should focus on materials, process and device technology for OLED lighting or for OLED displays. The aim is to realise OLED devices over larger surfaces, with higher brightness, larger uniformity and longer lifetimes. A demonstrator should be provided at the end of every project. A specific target for OLED lighting is energy efficacy of above 100 lm/W, considering also improved out-coupling efficiency; a specific target for OLED display materials is to enable brightness well above several kcd/$m^2$. The materials have to allow sufficient life time for all colours and white light (lifetime of several hundred hours at 97% of the original intensity). Proposals should involve material suppliers and organic SSL/display manufacturers or suppliers.

### Expected impact:

- Cost performance breakthroughs - lighting systems with production costs of 1€/100 lm.
- Secured and reinforced industrial technology leadership and substantially increased market presence in lighting and displays.
- Improved business opportunities and value creation in Europe in lighting and displays by reinforced cooperation along the value chain.

### Type of Action:

Research & Innovation Actions (100% funding)

## EUJ 3 – 2014: Optical communications

### Specific Challenge:

The research activity focuses on technologies of optical transport networks, which will allow coping with the expected significant traffic growth and meet the flexibility requirements imposed by major trends in the evolution of network usage, out of which cloud computing notably.

### Scope:

The proposed research should target at least one of two following topics:

- Programmable optical hardware
- In order to allow more flexibility in the control and management of optical networks and enable the advent of software defined optical networking, further work in the development of flexible/programmable optical hardware is required.
- Super-capacity optical transport networks

The continuous increase in traffic demand calls for new approaches to transmission over optical fibres, so that progresses of several orders of magnitude can be achieved in the capacity of transport networks. Amongst these new approaches, one can notably mention Space Division Multiplexing.

### Expected impact:

- Key enabling technologies that contribute to the emergence of new generations of optical transport networks, which will allow coping with the expected significant traffic growth and meet the flexibility requirements.
- Joint contributions to International Standardization and/or Forum activities.

### Types of action:

Research & Innovation Actions (100% funding)

# WORK PROGRAMME 2014-2015

## SPECIFIC PROGRAMME IMPLEMENTING HORIZON 2020

## Leadership in enabling and industrial technologies (LEIT)

### *ii) Nanotechnologies, Advanced Materials, Biotechnology and Advanced Manufacturing (NMP)*

## NMK 2 - 2015: Integration of novel nanomaterials into existing production lines

### Specific challenge:

Nanomaterials are intended to improve the performance of existing production technologies, and to give new functionalities to products, such as lightweight solutions for transportation and construction, enhanced solutions for packaging, decreased wear and friction of yarns, and high-performance thermal insulation and UV shielding fibrous materials (e.g. hollow fibres). However, such new nanomaterials need to be introduced into production and the correct controlled conditions need to be created and maintained in industrial processes.

### Scope:

The scope of the topic covers the *development and demonstration in operational environments*, *up to qualification of the production system* the integration of technologies and processing for using novel nanomaterials in production; to improve the control and monitoring of the conditions required for the use of nanomaterials in industrial processes; to increase the level of robustness and repeatability of such industrial processes; to optimize and evaluate the increased performances of the production lines in terms of productivity; to assess the functionality and performance of the produced component/product.

The implementation of this project is intended to start at TRL 5-6, target TRL 7-8, Implemented as cross-KET activities.

### Expected impact:

- Accelerated market uptake of nanomaterials and products in one or more of the following sectors: fibre, yarn and textile; packaging products; energy; construction and building; and transportation;
- Improvement in existing manufacturing processes through integration of nano materials, demonstrating better resource efficiency, safety, sustainability and recyclability of a wide variety of components and final products;
- Improvement in technical knowledge on the integrated manufacturing processes for nanomaterials in terms of productivity and cost-effectiveness.
- Contribution to development of business plans that encourage private sector investment for future business growth.
- Promoting safe-by-design approaches in collaboration with the EU nano-safety cluster and contributing towards the framework of EU nanosafety and regulatory [24]strategies6.

**Type of action:** Innovation Actions (70% funding)

[2]8 EU Nano-safety strategy 2015-2020 and NanoReg project

## NMK 3 - 2015: Manufacturing and control of nanoporous materials

### Specific challenge:

There is a constantly growing interest in nanostructured porous materials, thanks to the many applications that can benefit from controlled porosity at the nanoscale. Nanoporous materials can have many kinds of pore geometries, structures and chemical compositions and possess unique surface, structural, and bulk properties that underline their important uses in various fields such as ion exchange, separation, catalysis, sensor, thermal insulation and purifications. While various methods are available for creating nanoporous materials in a laboratory environment, scaling-up and meeting the industrial demands in terms of quality and costs remain a challenge.

### Scope:

Projects should address the *development and demonstration in relevant environments* of reliable processes control and manufacturing routes, to obtain nanoporous materials with controlled porosity distribution aiming at improved mechanical properties, reliable permeation rate, high electrical resistance or other thermophysical and transport properties.

Projects should demonstrate the effectiveness of the developed approaches and technologies, through a pilot line aimed at the production of semi-finished products. The process and the material proposed should support and reflect developing guidance and standards relating to nanomaterials aspects.

The implementation of this project is intended to start at TRL 4-5, target TRL 6. Implemented as cross-KET activities.

### Expected impact:

- Supporting European competitiveness through accelerated market uptake of nanoporous materials in one or more of the following sectors: transport; energy; construction and building; medical equipment; and filtration; Improvement in cost-effectiveness and sustainability of nanoporous materials with a verified market viability of the pilot line;
- New market opportunities through introduction of novel products enabled by nanoporous materials;
- Demonstrated scaling-up of production of nanoporous materials, leading to higher production volumes, improved reliability and repeatability of products with lower production cost;
- Improvement in technical knowledge concerning manufacturing processes of nano porous structuring of materials with innovative methods and solutions.
- Contribution to on-going and future standardisation work in the field[25]
- Promoting safe-by-design approaches in collaboration with the EU nano-safety cluster and contributing towards the framework of EU nanosafety and regulatory strategies[26].

**Type of action:** Innovation Actions (70% funding)

[25] See Mandate M/461 addressed by the European Commission to CEN/CENELEC and ETSI. http://www.cen.eu/cen/Sectors/Sectors/Nanotechnologies/Documents/M461.pdf

[26] EU Nano-safety strategy 2015-2020 and NanoReg project

## NMK 4 - 2014: High definition printing of multifunctional materials

### Specific challenge:

Roll-to-roll (R2R) manufacturing encompasses a wide range of processes for high volume manufacturing involving flexible substrates. The use of R2R manufacturing has widened from paper and textiles to advanced multi-layer coatings and/or stacks, and to new industries with applications in printed electronics. Currently there is significant interest on the part of manufacturers in adapting R2R technologies for the miniaturisation of feature sizes to the nanoscale, which would provide a new and disruptive manufacturing technology.

### Scope:

Projects should address industrial needs by *developing and demonstrating in relevant environments* 2D and 3D printing with higher definitions (down to nanoscale) and higher throughput utilising novel materials. Technical challenges relate to developing suitable printing technologies for high resolution and a wide range of materials; achieving overlay accuracy, especially for multi-material applications; and obtaining the right functionality after drying/sintering.

Pilot line setting should be used to verify production speed and reliability, as well as sufficient yield, quality and functionality of the intended application.

The implementation of this project is intended to start at TRL 4-5, target TRL 6. Implemented as cross-KET activities.

### Expected impact:

- Significant improvements in industrial productivity in comparison with traditional processes, such as lithography, verified in a pilot line setting in terms of production speed and reliability, as well as sufficient yield, quality and functionality of the intended application;
- Contribution to improved resource efficiency, safety and sustainability of R2R printing processes and related products;
- Contribution to improved technical knowledge on R2R printing at the nanoscale, leading to new products and creating market opportunities for European industries;
- Identification of gaps in standards, paving the way for future pre-normative activities in the field.
- Promoting safe-by-design approaches in collaboration with the EU nano-safety cluster and contributing towards the framework of EU nanosafety and regulatory strategies9.

### Type of action:

Innovation Actions (70% funding)

## NMK 5 - 2014: Nanomaterials for printing applications

### Specific challenge:

The migration toward low cost liquid based high-resolution deposition and patterning processes such as ink jet, and screen printing compatible with plastic substrate and roll-to-roll systems requires that suitable nanomaterials formulations (inks) are available for end users in industrially relevant quantities.

### Scope:

Projects should aim at *developing and demonstrating in relevant environments* the synthesis and functionalisation of inorganic and hybrid nano-materials, for printing applications with high process throughput. Technical challenges relate to the optimisation of the synthesis process for controlling the crystallinity and morphology of functional particles, as well as obtaining the rheological properties needed for wet deposition technologies. Thedeveloped nanomaterials formulations should demonstrate process compatibility, non-toxicity, environmental friendliness and low-cost.

The implementation of this project is intended to start at TRL 4-5, target TRL 6. Implemented as cross-KET activities.

### Expected impact:

- Supply of low cost, high performance and environmentally friendly nanomaterials tailored for R2R processing, allowing European manufacturers to exploit the great growth opportunity in this field;
- Creation of new market opportunities for nanomaterials suppliers, SMEs in particular;
- Promote closer collaboration between materials suppliers, production engineers, equipment manufacturers and end-users, addressing the full value chain and leading to a competitive advantage in the market introduction of the final products;
- Contribution to standardisation in relation to nanomaterial interaction with the R2R printing process for better product and process design.
- Promoting safe-by-design approaches in collaboration with the EU nano-safety cluster and contributing towards the framework of EU nanosafety and regulatory strategies[10].

### Type of action:

Innovation Actions (70% funding)

## NMK 7 - 2015: Additive manufacturing for table-top nanofactories

### Specific challenge:

Additive manufacturing delivers a new manufacturing paradigm: it makes the rapid, distributive manufacture of complex objects possible, and has the potential to reduce waste. What is truly transformative about additive manufacturing is the potential to manufacture individual products anywhere in the world, and to customise each of them. Rather than make manufactured goods in one place and ship them around the world, additive manufacturing technologies, such as 3D printing makes it possible to send design blueprints instantaneously via the internet, and manufacture them when and where they are needed.

3D printers are growing in sophistication, and can create increasingly complex objects, including those with different component parts. Breakthroughs in techniques such as metal sintering mean that 3D printers are no longer restricted to generic plastics. The use of nanoparticles in 3D printing is progressing rapidly, and could vastly increase the range of products that can be manufactured in this way, potentially including chemicals.

### Scope:

As a part of a wider initiative towards nano-manufacturing, the objective of this topic is to advance the state-of-the art of AM materials through modification of their fundamental material properties using nanotechnology and to develop novel additive manufacturing 'printing' techniques that incorporate new functionalities in the manufactured components. For example, carbon nanotube structures could be embedded and combined with the printing process to perform electronic functions such as sensing and communications, or flexible polymer materials could be used to create bio-inspired structures.

Activities expected to be implemented at TRL 4-5. Implemented as cross-KET activities.

### Expected impact:

- Enables Europe to compete at the forefront of the additive manufacturing revolution, which in the long term will lead into entire new production and consumption paradigms;
- Enables manufacturing activities by SMEs to enter markets with innovations that were not possible before;
- Widening the range of available AM materials and functionalities in products will accelerate the transition of AM from mere prototyping towards production and use;
- Enabling functionality embedded in AM parts displaces the need for multiple manufacturing operations, making AM processes even more cost effective;
- Enabling the identification of future development needs in related fields, e.g. in seamless design-to-manufacturing software and standardization for material and process quality.
- Promoting safe-by-design approaches in collaboration with the EU nano-safety cluster and contributing towards the framework of EU nanosafety and regulatory strategies[12].

### Type of action:

Research & Innovation Actions (100% funding)

## NMK 19 - 2015: Materials for severe operating conditions, including added-value functionalities

### Specific challenge:

The need to develop materials which can perform well in severe operating environments is increasing with advances in technology and requirements for higher efficiency in all areas such as manufacturing, energy generation, transport and communications etc. This poses a major challenge for materials science, and requires a fundamental understanding of how the processing, microstructures and properties of such material interact in order to enhance their response under more severe conditions.

The general aim is to develop new products with a step change in efficiency (e.g. photovoltaic systems, solar collectors, lasers, nano-scale electronics for computers and communication, fuel cells, batteries, fire resistant materials and high temperature operating materials for turbines and heat exchangers for more efficient jet engines and power plants, new insulating, conducting, and magnetic materials).

### Scope:

Projects should develop bulk materials that can function within an aggressive environment without property degradation, synthesise new structures with useful properties, and force chemical reactions that normally result in damage to proceed along selected pathways that are either benign or initiate the self-repair of damage.

Projects should include appropriate numerical tools (e.g. density functional theory, molecular dynamics) to capture the multi-scale evolution of damage; and predictive modelling tools for materials operating in extreme environments. Standardisation and/or the production of (certified) reference materials may also be addressed as an integrated part of the research proposal. Proof of concept in terms of product and/or process must be delivered within the project, excluding commercially usable prototypes, but convincingly demonstrating scalability towards industrial needs. The cost effectiveness and commercial potential of the innovative technologies compared to state-of-the-art solutions currently available on the market should be quantified during the project, with the involvement of end users. The environmental sustainability of each proposed solution should also be assessed with special emphasis on efficient materials usage.

Activities expected to be implemented at TRL 5.

### Expected impact:

- Increase in competitiveness and sustainability of European industry through high value products and manufacturing processes in various sectors, e.g. transport, energy, electronics etc;
- Employment and training through engagement in cutting-edge technologies.

**Type of action:** Research & Innovation Actions (100% funding)

## NMP 25 – 2014/2015: Accelerating the uptake of nanotechnologies, advanced materials or advanced manufacturing and processing technologies by SMEs

**Specific challenge:**

Research results should be taken up by industry, harvesting the hitherto untapped potential of nanotechnologies, advanced materials and advanced manufacturing and processing technologies. The goal is to create added value by creatively combining existing research results with other necessary elements,12 to transfer results across sectors where applicable, to accelerate innovation and eventually create profit or other benefits. The research should bring the technology and production to industrial readiness and maturity for commercialisation after the project.

**Scope:**

The SME instrument consists of three separate phases and a coaching and mentoring service for beneficiaries. Participants can apply to phase 1 with a view to applying to phase 2 at a later date, or directly to phase 2.

**In phase 1,** a feasibility study shall be developed verifying the technological/practical as well as economic viability of an innovation idea/concept with considerable novelty to the industry sector in which it is presented (new products, processes, design, services and technologies or new market applications of existing technologies). The activities could, for example, comprise risk assessment, market study, user involvement, Intellectual Property (IP) management, innovation strategy development, partner search, feasibility of concept and the like to establish a solid high-potential innovation project aligned to the enterprise strategy and with a European dimension. Bottlenecks in the ability to increase profitability of the enterprise through innovation shall be detected and analysed during phase 1 and addressed during phase 2 to increase the return in investment in innovation activities. The proposal should contain an initial business plan based on the proposed idea/concept.

The proposal should give the specifications of the elaborated business plan, which is to be the outcome of the project and the criteria for success.

Funding will be provided in the form of a lump sum of EUR 50 000. Projects should last around 6 months.

**In phase 2,** innovation projects will be supported that address the specific challenge and that demonstrate high potential in terms of company competitiveness and growth underpinned by a strategic business plan. Activities should focus on innovation activities such as demonstration, testing, prototyping, piloting, scaling-up, miniaturisation, design, market replication and the like aiming to bring an innovation idea (product, process, service etc) to industrial readiness and maturity for market introduction, but may also include some research. For technological innovation a Technology Readiness Levels of 6 or above (or similar for non-technological innovations) are envisaged; please see part G of the General Annexes.

Proposals shall be based on an elaborated business plan either developed through phase 1 or another means. Particular attention must be paid to IP protection and ownership; applicants will have to present convincing measures to ensure the possibility of commercial exploitation ('freedom to operate').

Proposals shall contain a specification for the outcome of the project, including a first commercialisation plan, and criteria for success.

The Commission considers that proposals requesting a contribution from the EU between EUR 0.5 and 2.5 million would allow phase 2 to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts. Projects should last between 12 and 24 months.

In addition, **in phase 3**, SMEs can benefit from indirect support measures and services as well as access to the financial facilities supported under Access to Risk Finance of this work programme.

Successful beneficiaries will be offered coaching and mentoring support during phase 1 and phase 2. This service will be accessible via the Enterprise Europe Network and delivered by a dedicated coach through consultation and signposting to the beneficiaries. The coaches will be recruited from a central database managed by the Commission and have all fulfilled stringent criteria with regards to business experience and competencies. Throughout the three phases of the instrument, the Network will complement the coaching

support by providing access to its innovation and internationalisation service offering. This could include, for example, depending on the need of the SME, support in identifying growth potential, developing a growth plan and maximising it through internationalisation; strengthening the leadership and management skills of individuals in the senior management team and developing in-house coaching capacity; developing a marketing strategy or raising external finance.

**Expected impact:**

- Enhancing profitability and growth performance of SMEs by combining and transferring new and existing knowledge into innovative, disruptive and competitive solutions seizing European and global business opportunities.
- Market uptake and distribution of innovations tackling the commercial uptake of nanotechnologies, advanced materials and advanced production technologies in a sustainable way.
- Increase of private investment in innovation, notably leverage of private co-investor and/or follow-up investments.
- The expected impact should be clearly described in qualitative and quantitative terms (e.g. on turnover, employment, market seize, IP management, sales, return on investment and profit).

**Type of action**:

SME Instrument (70% funding)

## NMK 26 - 2014: Joint EU & MS activity on the next phase of research in support of regulation "NANOREG II"

### Specific challenge:

Regulation of the nanomaterials market evolves parallel to technology development and societal requirements. The commercial viability of nanomaterial development in the EU is conditional on new nanomaterials meeting current and future regulatory requirements and should be based on cutting-edge technology with regard to risk management and risk mitigation. Demonstration of integration of such technology into the design of new nanomaterials and products and their applications is a major challenge and the main objective of this joint action.

### Scope:

(1) To develop and demonstrate Safe-by-Design regulatory approaches for nanomaterial development.

(2) To validate the tools and methodology, as well as their background data-sets, that will lead to the manufacture of novel, inherently safe nanomaterials.

(3) To address barriers for the application of Safe-by-Design as standard industry practice. he project should seek to establish principles for grouping strategies for nanomaterials according to their assumed modes of toxicological action for regulatory purposes. Out of each group, a few representative materials should be selected and a toxicological profile shall be assessed. The scope may include novel materials, coated materials and self-assembled materials, nanomaterials with different surface functionalisation, and third generation particles. The project should take into account future dossier requirements under REACH, or other related EU legislation, to limit the required additional information, especially animal testing, to the essential minimum. Active participation of industrial partners is strongly encouraged to establish strong industry-authorities collaboration and the partners should conclude a results communication policy before the start of the project. This collaboration should be complemented by solid mechanisms networking state and private laboratories in nanotechnology toxicity testing and exposure control.

Activities expected to be implemented at TRL 6. Jointly funded with Member States; a maximum of one project will be funded.

### Expected impact:

The project is expected to:

- Strengthen seamless collaboration among authorities of the MS governments with regard to the knowledge required for appropriate risk assessment and management in this field given the fast development of the market;
- Bring together the activities of national authorities responsible for consumer and worker protection, public health, and the environment including chemical safety and all other relevant authorities covering the whole value;
- Coordinate regulatory oriented activities of, or cooperate with, other on-going projects on toxicity testing, on decision making for material characterisation and testing protocols, and for data management; and
- Integrate its work with OECD-WPMN, CEN29 and ISO, and other European funded projects in the nanosafety cluster.

### Type of action:

Research and Innovation Action (100% funding); no more than one project will be funded[27]

[27] See Mandate M/461 addressed by the European Commission to CEN/CENELEC and ETSI. http://www.cen.eu/cen/Sectors/Sectors/Nanotechnologies/Documents/M461.pdf

## NMK 27 - 2014: Coordination of EU and international efforts in safety of nanotechnology

### Specific challenge:

The development of a novel safety culture for the nanomaterial research and engineering community, and the industry producing engineered nanomaterials and nano-enabled products is a significant challenge in the coming years. Incorporating the safety-by-design as a part of the core research activities of nano material sciences and the production of these materials and products would be a major step forward in assuring nanosafety. Such activities are currently on going in the EU and several other industrialised countries in a rather fragmented manner. The efforts of emerging economies and emerging science countries should also be integrated with the leading actors in the area of nanosafety.

### Scope:

The main aim is to bring together EU member states and international efforts for risk assessment, management and governance by streamlining data collection and data management on regulatory oriented toxicology testing of nanomaterial, exposure monitoring, LCA, and disposal and treatment of waste nanomaterials. The coordination may focus on one or more of the following tracks:

- Coordination of EU and international efforts in support of regulation, in particular within the context of Nanoreg, which is a major undertaking jointly funded by FP7, EU Member States, FP7 Associated States and industry, and of the work carried on by OECD-WPMN;
- Expanding the international dimension of EU nano-safety research e.g. through networking of researchers, twinning of projects or creation of Communities of Research with the objective of sharing of best practises and harmonising test methods.
- Widening the coordination of MS, AS and regional R&D efforts aimed at management of nano-related risks with the objective of pooling resources for a transnational programme of nano-safety research along the lines of the nanosafety cluster Strategic Research Agenda 2015-2020.

### Expected impact:

- By exploiting synergies with, mainly national European but also world-wide, activities aiming at support to regulation, the project should lead to joint projects, twinned projects and global networks facilitating the goal of risk management and incorporating risk assessment in the early stages of product or process design
- The project should combine efforts with those of the Nanoreg project so that the expected datasets from the latter be complemented and cross validated with similar datasets from other projects running globally in order to reach OECD - MAD (Mutually Accepted Data) status identifying and brushing-out any inconsistencies.
- The impact of the NANOREG initiative, in establishing a seamless cooperation between industry, including risk engineering, and authorities, should be enhanced and expanded to include global market leaders.
- The project is expected to promote standardisation at international level.

### Type of action:

Coordination and Support Action; no more than one project will be funded

## FoF 2 – 2014: Manufacturing processes for complex structures and geometries with efficient use of material

### Specific challenge:

In current market and technological context, mechanical products have to be designed and produced taking into account structural optimisation (which often involves complex structures and geometries) and economically efficient production (i.e. productive and flexible manufacturing). Automated manufacturing of complex geometries can be related to issues such as 3D structured, multi-layered and hybrid materials, joining issues or the joint- free realisation of complex shapes. Moreover, newer constraints are coming from requirements of sustainability in production processes (resource and energy efficiency), both through additional regulations and through the increased materials and energy costs. The main aims in the manufacturing of complex structures are quality and productivity with minimum use of material and energy.

### Scope:

Three complementary approaches can be considered: Innovative resource-efficient manufacturing processes (through tolerance to recycling / remanufacturing or through first time right approaches), innovative energy efficient machinery, and developments in process control allowing both to cope with more recycling in the process and to increase output quality (i.e. reduce out-of-tolerance products that have to be refused).

Research activities should address several of the following areas:

- Manufacturing process control and monitoring strategies based on integrated models of both processes and machines, with modules for resource and energy efficiency planning and monitoring, and with capability of selection of the best process and machine for the part to be manufactured.
- Innovative process concepts and tools, including design, for resource efficiency in complex geometries manufacturing.
- Innovative machinery improving resource efficiency from the current state of the art in complex geometries manufacturing.
- Remanufacturing and recycling, with novel or improved use of waste streams.

Activities expected to be implemented at TRL 4-6.

### Expected impact:

The impact on the areas of application of the projects is expected to be:

- Reduction of at least 30% in the material usage pertaining to the manufacturing of complex structures and geometries when compared to current average values.
- Reduction of at least 20% in the overall energy consumption related to the manufacturing of complex structures and geometries when compared to current average values.
- Elimination of faulty manufactured parts by the adequate combination of integrated process-machine approaches with a continuous control of process parameters.

### Type of action:

Research & Innovation Actions (100% funding).

## FoF 4 – 2014: Developing smart factories that are attractive to workers

Specific challenge: In a very competitive environment, manufacturing enterprises will need to be attractive to potential workers. This will require new thinking both on scheduling of work and design of attractive workplaces. The aim is to demonstrate the operation of a real smart factory, in which image processing will allow for "knowing and recognising in the background" users gestures, their interaction among each other and provide them with on the spot possibilities to access or develop knowledge needed for their respective tasks. By using interactive displays and reassessing the definition of gestures, machine-man interaction will be improved while providing an attractive workplace in which workers can develop their own competences and skills as well as their implication in the future of the organisation.

### Scope:

Demonstration activities should be multi-disciplinary, involving in particular as appropriate disciplines of Social Sciences and Humanities, and address all of the following areas:

- Methodologies and tools for efficient design or re-adaptation of production facilities based on co-evolving product-process-production systems considering simultaneously productivity aspects and the wellbeing and autonomy of the workers, through the integration of technologies.
- New methods and technologies for an optimised take-up and use of workers' knowledge, to stimulate team interactions and to enhance work related satisfaction taking into consideration safety and ergonomics of the working areas.
- Integration of innovative production technologies supporting increased productivity and flexibility.
- Incorporating aspects linked to education and to attractiveness to youth (e.g. in-factory teaching, "factory-lab" concepts).

Attractive research will support manufacturing enterprises in Europe in their respective efforts for talents to be employed in attractive manufacturing jobs. Proof of concept in terms of at least one industrial pilot demonstrator should be delivered before the end of the project, convincingly demonstrating a solution to industrial needs.

Activities expected to be implemented at TRL 5-7.

### Expected impact:

The impact on the areas of application of the projects is expected to be:

- In economic terms, an increase of 20% in productivity due to an increased commitment of people, better organisation of work, reduction of absenteeism in the workplace and by increasing the pool of potential workers through widening the skill profile.
- In social terms, an improvement in the working conditions in factories and in the attractiveness of the working environments in particular for young people.
- Improved work satisfaction of employees within the factories of the future.
- Strengthened global position of European manufacturing industry through the introduction of the new technologies.

### Type of action:

Innovation Actions (70% funding).

## FoF 12 – 2015: Industrial technologies for advanced joining and assembly processes of multi-materials

### Specific challenge:

Multi-material design of components and structures provides an opportunity to develop products which are able to operate under more exigent requests demanded by market and society such as increased strength-to-weight ratio, multi-functionality, highly aggressive environments and low carbon footprint. By smart use of adequate joining technologies, and the incorporation of multi-material design into the assembly chain, the final product performance can be improved. This is particularly relevant when high cost, scarce or hazardous materials are involved.

### Scope:

Traditional joining leads to loss of the performance that materials offer in their final product, because of modifications in composition and properties or geometric distortion. Improved, new or hybrid joining and assembly processes are therefore needed to be developed for specific combinations of designs and materials in order to overcome the mentioned limitations. Technologies to be addressed can be welding processes, bonding using adhesives, mechanical joining or any other joining process. Formulation of new adhesives is excluded from the scope of the topic. The novel joining integration capabilities will feature a high degree of process automation and quality control and they will make use of sustainable manufacturing practises. Assembly and disassembly efficiency, product quality, recycling and cost targets will also be considered. While the focus will be on demonstrating the technologies, R&D activities supporting the integration and scale-up are expected as well.

Demonstration activities should focus on all of the following priorities:

- Joining and assembly processes that will lead to maximise performance of the joints, based on a deep understanding of the cause-effect relationships as well as of materials process interactions.
- The implementation of numerical simulation techniques that will lead to a better understanding of the considered joining processes as well as product development along all its different phases.
- The development of high efficient, cost-effective and flexible surface condition solutions (e.g. surface modification, thermal treatments, gap avoidance) to provide joints with the maximum performance.
- The implementation and set up of reliable, efficient and automated non-destructive inspection techniques for joint quality evaluation, together with in-situ monitoring and control systems for critical variables of the joining operations that will guarantee reliable, robust and safe production conditions in industrial environments.

At least one prototype or pilot implementation in pre-industrial settings aiming at demonstrating the scalability should be delivered before the end of the project as a proof of concept.

Activities expected to be implemented at TRL 6-7.

### Expected impact:

Application of multi-material design to products through the developed joining and assembly processes will bring:

- At least 30% decrease in the consumption of high cost and critical materials.
- At least 30% improvement of the product performance, without increasing the final price.
- A higher level of automation and lower production times compared to current technologies.

### Type of action:

Innovation Actions (70% funding).

## FoF 0 – 2014: Development of novel materials and systems for OLED lighting or displays

*[Topic jointly implemented with the ICT part of LEIT]*

### Specific challenge:

The further technological development of solid-state light sources (LEDs and OLEDs) and of energy efficient lighting systems is expected to give Europe a leading position on the world lighting market and create new manufacturing jobs for novel consumer products. Moreover, the move to solid-state lighting based on inorganic (LED) and organic (OLED) semiconductors constitutes an important factor in reducing the amount of electricity consumed by lighting and thus limiting carbon dioxide emissions. Much of the research on lighting will also be relevant to advanced displays.

### Scope:

Research and Innovation actions should focus on materials, process and device technology for OLED lighting or for OLED displays. The aim is to realise OLED devices over larger surfaces, with higher brightness, larger uniformity and longer lifetimes. A demonstrator should be provided at the end of every project. A specific target for OLED lighting is energy efficacy above 100 lm/W, considering also improved out-coupling efficiency; a specific target for OLED display materials is to enable brightness well above several kcd/m2. The materials have to allow sufficient lifetime for all colours and white light (lifetime of several hundred hours at 97% of the original intensity). Proposals should involve material suppliers and organic SSL/display manufacturers or suppliers.

Activities expected to be implemented at TRL 4-5. Implemented as cross-KET activities.

### Expected impact:

- Cost-performance breakthroughs – lighting systems with production costs of 1€/100 lm;
- Secured and reinforced industrial technology leadership and substantially increased market presence in lighting and displays;
- Improved business opportunities and value creation in Europe in lighting and displays by reinforced cooperation along the value chain.

## SPIRE 1 – 2014: Integrated Process Control

### Specific challenge:

Process control of the industrial operations has a major role in assuring high quality standards and optimal operations in terms of resource use and economic viability. Technological progresses in this area that could allow measuring properties of process streams and final products, accurately and in real-time could represent a major step forward towards more reliable and sustainable industrial operations. These real time process data (e.g. chemical composition data) could allow the implementation of "near real time" closed-loop process control concepts making it possible to operate industrial processes at their optimum both economically and ecologically. To obtain real time process data, the development of reliable fast inline measurements will be fundamental. These measurements can easily be integrated into closed loop process control concepts, thus delivering the highest value and near real time process control for industrial operations and decision making support tools. The development of these new "near real time" integrated process control methods is particularly important considering the recently introduced intensified or modularised production concepts, e.g. presenting smaller continuously operated pieces of equipment or integration of process steps that pose new challenges for process analytics in terms of size and speed of analysis.

### Scope:

New technologies suitable for " near real time" integrated process control are expected to introduce significant novelties with respect to sensor technologies, data treatment and data mining, in particular:

- Provision of dynamic information about product properties, stream characteristics and process conditions
- Provision of spatially resolved process data.
- Sensors for intensified process technology.
- Fast inline measurements (instead of extractive ones).
- Robustness and reliability insuring minimum operation and maintenance costs

Proposals submitted under this topic should address several aspects which are considered of major importance in this area; such as:

- Cross-sectorial application of process analyser technology (PAT) in closed-loop process control capable of inline measurements.
- Integration methodologies within a large number of production conditions.
- Swarm sensors.
- Development of new soft-sensors and sensing concepts and models for improved process control using PAT data for the measurement of properties and quality of process streams and final products.
- Miniaturized process analyser technology (PAT) and PAT-based advanced control for intensified processes.
- Disposable sensors in batch and in continuous processes.
- Control strategies for flexible processes or disposable sensors using integrated and validated PAT data.

Proposals submitted under this topic are expected to demonstrate the proposed technologies and control systems in relevant industrial environments, to proof their technical feasibility and economic viability. Activities expected to be implemented at TRL 3-5.

### Expected impact:

- Improved capabilities for valid, reliable and real-time measurement of the properties and quality of process streams and final products for existing and for more flexible process operation concepts.
- More sustainable plant operations due to the extensive usage of all information available from validated PAT measurements for model based control.

- Improved monitoring and control of continuous plants.
- Improved support of the operators leading to safer, more reliable and sustainable process operation improving process efficiency.
- Better process operations with respect to resource and energy efficiency.
- Significant decrease in greenhouse gas emissions.
- Strengthening of the competiveness of the European industry both in the domain of PAT technologies and control solutions and with respect to economically sustainable industrial processes.
- Retention and creation of jobs for the European measurement and automation and process industries.

**Type of action:**

Research & Innovation Actions (100% funding).