European Commission

EN

Horizon 2020

Work Programme 2016 - 2017

5. Leadership in enabling and industrial technologies - Introduction

Important notice on the second Horizon 2020 Work Programme

This Work Programme covers 2016 and 2017. The parts of the Work Programme that relate to 2017 (topics, dates, budget) have, with this revised version, been updated. The changes relating to this revised part are explained on the Participant Portal.

(European Commission Decision C(2016)4614 of 25 July 2016)

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Introduction

Policy context and objectives

Leadership in enabling and industrial technologies (LEIT) includes the parts of Horizon 2020 focusing on new opportunities for industrial leadership in Key Enabling Technologies (KETs), ICT and Space. These are areas of key industrial competences determining Europe's global competitiveness. Aiming at new and breakthrough technologies, this part of the programme will contribute to boosting competitiveness, creating jobs and supporting growth. It helps to achieve the EU Industrial policy[1] goals, in particular the goal to bring industry's weight in the EU's GDP back to 20% by 2020. It also represents an important component of the EU Strategy for Key Enabling Technologies[2].

1. Research and innovation to strengthen Europe's industrial capacities and business perspectives, including SMEs

The emphasis of the LEIT part of the Work Programme is on areas of R&D and innovation with a strong industrial dimension, where mastering new technological opportunities will enable and drive innovation. The activities included have been primarily developed with reference to relevant industrial roadmaps, including those of European Technology Platforms. The involvement of industrial participants, and of SMEs in particular, is crucial in maximising the expected impact of the actions.

A key element is the support for the development and deployment of Key Enabling Technologies (KETs) – micro-and nano-electronics, nanotechnologies, advanced materials, advanced manufacturing and processing, biotechnology and photonics, enabling innovation in all key industrial sectors. Advanced manufacturing in particular is considered as a cross-cutting issue, underpinning innovation. Beyond this direct support, a number of activities across this Work Programme are dedicated to support **EU manufacturing**. Complementing this approach, the part of Horizon 2020 on Future and Emerging Technologies includes support for KETs at lower Technology Readiness Levels (TRLs) than in the LEIT part.

The funded projects will be outcome oriented, developing key technology building blocks, bringing solutions closer to the market, and paving the way for industrial and commercial implementation, including in areas of societal challenges. Proposers are asked to demonstrate how the exploitation of results will generate the expected impact and contribute to the European economy.

Several research and innovation activities in this part of the Work Programme may be enhanced through a combination of funding sources, from other EU, national or regional

[1] 'An integrated industrial policy for the globalisation era' (COM(2010)614)

[2] 'Preparing for our future: Developing a common strategy for key enabling technologies in the EU' (COM(2009)512); and 'A European strategy for Key Enabling Technologies – A bridge to growth and jobs' (COM(2012)341).

programmes (supported or not by the European Structural and Investment Funds[3]), and from financial instruments. Consortia are encouraged, where appropriate, to use synergies with structural funds (ESIF) in the context of smart specialisation, or to mobilise funding from other available instruments, to pilot and deploy their technologies.

It is precisely the manufacturing capacity, or access of SMEs to appropriate infrastructures such as pilot lines, and the development of such infrastructures, that this combined funding can support. For innovative SMEs in particular, it is important to ensure a full involvement in industrial value chains, and access to pilot lines and RTOs, or technology infrastructures offering services to SMEs, allowing them to design, prototype, test and ultimately produce their innovations.

2. Public-private partnerships (PPPs)

Public-private partnerships (PPPs) are vehicles to implement technological roadmaps in particular areas and achieve leverage of private funding. They are implemented either through Joint Technology Initiatives (JTIs) using Joint Undertakings based on article 187 TFEU, or through dedicated calls for proposals and topics (contractual PPPs).

The LEIT part of Horizon 2020 includes the following PPPs:

Joint Technology Initiatives:

- The Joint Technology Initiative on Electronic Components and Systems for European Leadership (ECSEL)
- The Joint Technology Initiative on Bio-based Industries.

These two JTIs will develop their own work programmes, which will be decided and implemented through their specific governance mechanisms and rules.

Contractual PPPs:

- Factories of the Future, Energy-efficient Buildings, Sustainable Process Industries (SPIRE), Advanced 5G Network Infrastructure (5G), Robotics, Photonics, High Performance Computing, Big Data and Green Vehicles.

The implementation of these cPPPs is done according to the contractual arrangements signed on 17 December 2013 (for all except for Big Data cPPP which was signed on 13 October 2013) by the European Commission representing the public side and the respective industrial research and innovation European association representing the private side of each cPPP. These contractual PPPs are implemented in this work programme through different topics and calls. Robotics, Photonics and 5G are exclusively covered under the ICT part, while Factories

[3] For more information on R&I funding from ESIF, see http://ec.europa.eu/regional_policy/activity/research/index_en.cfm

of the Future, Energy Efficient Buildings and SPIRE are cross-thematic, in that some of their topics are placed elsewhere in the work programme.

A list of cPPP topics in the Work Programme 2016-17 is provided in a separate document (LEIT List A[4]).

3. Strategic orientation on innovative technologies closer to the market

A great number of activities aim to develop innovative technologies bringing them closer to the markets, including a progress towards higher Technology Readiness Levels (TRLs).[5] This will help the manufacturing sectors to adapt to global competitive pressure by improving their technological base. As proposed in the European KET Strategy, the KET parts of this work programme use TRLs where relevant. This Work Programme addresses TRLs from 3-4 up to 7, with an overall centre of gravity in the range from 5-6, with the highest level reserved for cases where there is strong industrial commitment.

To optimise impact, the following aspects should be considered by proposals wherever appropriate:

- Well-targeted value chains enable to capture value to Europe – this aspect should be reflected in the quality of the consortium and the work plan to ensure optimal structure to maximise impact.

- Adequate balance of industrial and research partners for the delivery of the expected outcome beyond the end of the project.

- In order to facilitate up-scaling, aspects such as demonstration, transfer and piloting should be included as a part of the R&D&I actions. Where standardisation needs are identified, they should be followed up.

- The integration of business development, time to market, and market understanding, together with the understanding and exploitation of customized and personalized products and services in the business-to-business context is necessary to meet innovation needs in the range TRL 5-7.

- Proof-of-concept prototypes, demonstration, assessments, platform-building activities, and pilots help to overcome the acceptance barrier, increase trust and convince potential users, express additional value benefits for diversified communities, provide seeds for new projects of the proposers also in other parts of Horizon 2020, and develop mechanisms for facilitating value creation in the real economy.

- Non-technical and regulatory issues regarding health, safety and the environment should accompany the development of industrial applications, especially in fields such as nanotechnologies, where potential risks and public concerns have been identified.

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[4] http://ec.europa.eu/research/participants/data/ref/h2020/other/wp/h2020-wp1617-list-cpps-kets_en.pdf

[5] See COM(2012)341, pp. 17-18 and Annex 21 to the Work Programme, Section G.

- Including social sciences and humanities (SSH) expertise in the approach can provide a constructive and critical accompaniment of the scientific and technological developments in funded projects.

4. Industry 2020 in the circular economy

This focus area is at the heart of how Horizon 2020 contributes to boosting and renewing Europe's industrial capacities and the real economy while ensuring economic, environmental and social sustainability, in the context of the circular economy.

It aims to demonstrate the economic and environmental feasibility of the circular economy approach and at the same time gives a strong impetus to the re-industrialisation of the EU, by developing and deploying new approaches and technologies. The focus area will make contributions to the goals outlined in: 'Towards a circular economy: A zero waste programme for Europe'[6] and 'European Industrial Renaissance'[7]; and reflect the Council conclusions of March and June 2014, in particular the Council's call for clean tech.[8] This focus area brings together complementary activities, which as a whole will address the overall objectives of enhancing European industrial competitiveness and moving towards a circular economy.

Major contributions come from LEIT-NMBP and LEIT-ICT (as support to the process and manufacturing industries via the cPPPs SPIRE and Factories of the Future); and the Societal Challenge 'Climate action, environment, resource efficiency and raw materials' (as support for the overall goal of circular economy and systemic eco-innovation).

The LEIT-NMBP and LEIT-ICT activities include also a set of activities to support Additive Manufacturing. Additive Manufacturing, including 3D Printing, holds the promise of transforming the manufacturing value chain, allowing a shift from mass production to full customisation and local production.

Support activities complete the focus area, designed to address policy, standardisation, clustering of projects and industry-targeted dissemination.

5. Cross-cutting KETs

Cross-cutting KETs bring together and integrate different KETs and reflect the interdisciplinary nature of technological development. They have the potential to lead to unforeseen advances and new markets, and are important contributions to new technological components or products.

The integration of different KETs represents a vital activity in Horizon 2020. Over the course of Horizon 2020, around 30% of the budget allocated to KETs will go to integrated KETs projects. Cross-cutting KETs activities will in general include activities closer to market and applications. Examples include pilot lines and demonstrator projects at high Technology

6 COM(2014) 398 final, 2 July 2014
7 COM(2014) 14 final, 22 January 2014
8 ST 7 2014 REV 1, 20-21 March 2014 and ST 79 2014 INIT, 26-27 June 2014

Readiness Levels (5-7), but also activities at lower Technology Readiness Levels, which address specific value chains (with a view to subsequent innovation at higher TRLs). Manufacturability will often be a key issue on the innovation path towards the market, and pilot activities will normally combine at least two different KETs and integrated advanced manufacturing technologies/processes, in a way that value is created beyond the mere addition of the individual technologies for a component or product.

The topics calling for pilot lines are considered as potential test cases for ambitious projects of industrial scale. They are therefore particularly suitable for efforts to combine funding instruments, including relevant national or regional research and innovation programmes, and European Structural and Investment Funds (ESIF) under smart specialisation strategies.

The cross-cutting KET activities are complemented by actions addressing specific cross-cutting issues (exchange of information and best practices, expression of interest, exploring possibilities for combined funding, etc.).

Cross-cutting KET activities including pilot lines and demonstrators are listed in a separate document (LEIT List B[9]) and grouped in main areas of high industrial interest and innovation potential.

Definition of pilot lines / plants: A pilot line/plant is an industrial manufacturing or processing installation for generating information about the behaviour and performance of larger or full-scale facilities. Pilot lines are aimed at enhancing industry's ability to quickly turn R&D into innovative products, gaining a competitive edge or enabling new markets.

In technological terms, a pilot line/plant follows on R&D where the proof-of-concept and technology validation of the product, material or equipment in a laboratory environment already has already taken place (TRL 4 completed).

A pilot line/plant develops, up-scales or optimises manufacturing/process technology, and delivers KET-based prototype products, materials or manufacturing equipment, matching the performance standards of users, allowing the assessment of the technological and economic performance of the product or process. Pilot line/plant projects hence cover technology validation in relevant environment (TRL 5), technology demonstration in relevant environment (TRL 6) and up to technology demonstration in operational environment (TRL 7). These TRL descriptions are intentionally generic. The critical technology elements to be validated or demonstrated, as well as the specifics of a relevant or operational environment, depend on the particular application and the intended use of a given technology.

Pilot lines/plants can also be used to train personnel for a full-scale facility.

A pilot line/plant is typically smaller than a full-scale manufacturing line/process plant, but may be built in a range of sizes. For example, some pilot plants are built as portable modules that can easily be transported as a contained unit.

[9] *http://ec.europa.eu/research/participants/data/ref/h2020/other/wp/h2020-wp1617-list-cpps-kets_en.pdf*

Pilot lines/plants are used to reduce the risk associated with construction of large manufacturing lines/ process plants. In terms of cost, pilot lines/plants are substantially less expensive to build than full-scale lines/plants. Design changes can be made more cheaply at the pilot scale and inefficient processes or unfeasible technical requirements can be detected before committing the resources to a full scale implementation.

The operational characteristics and parameters of a pilot line/plant, such as production speed and volume, strongly depend on the particular application. Where relevant, requirements for operational characteristics and parameters may be presented within the topic descriptions.

Two principal types of pilot lines/plants can be foreseen:

- Proprietary pilot lines/plants, typically dedicated to a single industry owner. Nevertheless, several industrial companies in the value chain of the owner may participate in the pilot line/plant development, gaining benefits. In addition, technology transfer arrangements may be used to further promote rapid deployment and commercialisation of the new technology.

- Open pilot lines/plants, typically owned and operated by RTO's, where industrial users, in particular SMEs can come and develop, test and validate specific products and processes, taking advantage of the pilot line/plant operator's infrastructure and know-how.

6. Solutions addressing societal challenges, which can in turn lead to further markets

Future solutions to the major Societal Challenges will require the deployment of key enabling technologies, ICT components and systems, communication infrastructure as well as data derived from the Union Earth observation and satellite navigation programmes. The activities under this part of the Work Programme will further develop the technologies that are needed to enable promising solutions for important (focus) areas and applications addressing societal challenges, ensuring that EU industry remains strong in the core technologies that are at the roots of future value chains, and aiming at advances which will be taken up and further developed in the respective value chains.

The societal benefits deriving from the LEIT-NMBP technologies and their convergence[10] (including with the other key enabling technologies) will be showcased in two important areas, healthcare and energy. These areas can demonstrate the value of vision-inspired science, and technologies brought to bear on critical societal issues. Efforts in these areas are also justified by the relative maturity of the underlying technologies. New production and business models will also support climate and environment goals.

- Advanced materials and nanotechnologies for healthcare (nanomedicine): Nanomedicine activities aim at shortening the long research, development and regulatory approval process, reducing the associated costs, so as to deliver safe, efficacious and cost effective products to

[10] Convergence of nanotechnologies, materials and other KETs is defined as the escalating and transformative interaction among seemingly different disciplines, technologies, communities, and domains of human activity to achieve mutual compatibility, synergism and integration, and through this process to create added value and branch out to meet human needs and shared goals.

meet the demands for improved healthcare. Operationally, they should target translation of new products from "lab-to-bedside". This should apply to all aspects of nanomedicine, including biomaterials for tissue engineered products, nanosystems and nanodevices for targeted drug delivery, diagnosis and molecular imaging, etc. Activities will be positioned with respect to the activities of Societal Challenge 'Health, demographic change and well-being' (including Micro-Nano-Biosystems and e-Health), the European Research Council (Frontier Research), Research Infrastructures, involvement of the European Medicines Agency, and others. In particular, it is expected that the societal challenge 'Health, demographic change and well-being' will provide support for the clinical investigations for nanotechnology-derived approaches and products.

- Advanced materials and nanotechnologies for energy applications: Activities will focus on providing advanced materials and nanotechnologies solutions in support of implementing the European energy policy, which addresses the energy system as a whole with a focus on its sustainability and security of supply while generating affordable energy. Cost reduction through the development of new technological options for promising energy technologies considering the whole value-chain, in an approach that takes into account consumers and market factors, successful diversification of energy sources, increasing the share of energy production from renewables, decentralising energy production, development of flexible energy storage and decarbonisation of fossil energy sources rely on cross-cutting KETs. Relevant innovations in advanced materials and nanotechnologies that would contribute to address the energy challenges leverage existing R&D results and project clusters for reaching market deployment and activities will also contribute to implementation of the integrated roadmap with support of all relevant stakeholders, such as EMIRI.[11] Clear performance and deployment targets are being identified, in the context of a complete portfolio for energy, coordinated with the activities under the Societal Challenge 'Secure, clean and efficient energy'.

- Space: Earth observation (EO) activities under Horizon 2020 are considered an essential element to accompany the investments made by the European Union in Copernicus, the European Union Earth observation and monitoring programme, and in the Global Earth Observation Systems of Systems (GEOSS). The activities addressing Earth Observation funded by societal challenge 2, societal challenge 5, LEIT/Space and Research Infrastructures form a coherent overall approach. In this context, activities under LEIT-Space address the evolution of Copernicus and the exploitation of existing European space infrastructure by promoting the development of innovative products and services based on remote sensing, geo-positioning or other types of satellite enabled data as well as geo-information generated already by services such as Copernicus services. As regards the application of satellite navigation technology in transport, topics related to satellite navigation under LEIT-Space are coordinated with relevant topics under Societal Challenge 4.

7. Business cases and exploitation strategies for industrialisation

[11] Energy Materials Industrial Research Initiative

This section applies only to those topics in the LEIT part of this Work Programme, for which proposers are asked to demonstrate the expected impact by including in their proposals a *business case and exploitation strategy for industrialisation*.[12] The business case and exploitation strategy will be evaluated under the 'Impact' criterion.

The *business case* should demonstrate the expected impact of the proposal in terms of enhanced market opportunities and manufacturing capacities for European enterprises, and thus growth and jobs in Europe, in the short to medium term. It should describe the targeted market, in terms of targeted sectors; estimated size in Europe and globally; user and customer needs; and demonstrate that the solutions will match the market and user needs in a cost-effective manner; and describe the expected market position and competitive advantage.

The *exploitation strategy* should be realistic and identify obstacles, requirements and necessary actions involved in reaching higher TRLs, such as

- Improved material/product robustness and reliability;
- Addressing European value chains;
- Securing an industrial integrator to adapt the new technologies to industrial scale;
- Availability of large-scale testing, pilot and manufacturing facilities;
- Standardisation;
- Product approval by regulatory and/or relevant international bodies;
- Sustainability of financing (after the EU funding).

For TRLs 6-7, a credible strategy to achieve future full-scale manufacturing in Europe is expected, indicating the commitments of the industrial partners after the end of the project (including financial commitments). In the case of demonstrators and pilot lines, the planned use and expected impact from using the final installation should be considered.

Exploitation plans, outline financial arrangements and any follow-up will be developed further during the project.

The results of these activities as well as the further activities envisaged in this respect should be covered by the final report (and intermediate deliverables) of the project.

Synergies with other funds: Where possible, proposers could actively seek synergies with, and possibilities for further funding from other relevant EU, national or regional research and innovation programmes (including ESIF), private funds or financial instruments. In all these cases, business cases and exploitation strategies will outline such synergies and/or additional funding.

[12] For LEIT-ICT, this formulation applies only to contributions to Factories of the Future (FoF-11,12,13)

One possibility is that of cumulative funding with European Structural and Investment Funds (ESIF) in connection with smart specialisation strategies. Consortia could therefore identify, amongst other possibilities, the Smart Specialisation fields of their EU Member States or regions.[13] For this purpose the 'Guide on Enabling synergies between ESIF, H2020 and other research and innovation related Union programmes' may be useful.[14] Some projects may, moreover, contribute to regional smart specialisation strategies by capitalising on concentrated and complementary competences for the development of new industrial value chains and emerging industries with a clear EU added-value.

8. Modelling

Computational materials science has progressed into a predictive tool allowing explanation of the properties and behaviour of materials. Computational materials modelling is supported by a dedicated area: 'Actions to support developments in, and acceptance of, nanotechnologies, advanced materials and biotechnology - Modelling for the development of nanotechnologies and advanced materials'. Beyond these dedicated activities, the development and application of materials modelling may be included where relevant, and modelling is also highlighted in a number of topics.

Where materials modelling is proposed, the relevant work packages should be described similarly to the Review of Material Modelling.[15] If new software is developed, software engineering quality measures should be addressed.

Proposers are encouraged to contribute actively to ongoing activities, e.g. in the EMMC (European Materials Modelling Council), and EU funded clusters.

[13] http://s3platform.jrc.ec.europa.eu/map

[14] http://ec.europa.eu/regional_policy/sources/docgener/guides/synergy/synergies_en.pdf

[15] http://ec.europa.eu/research/industrial_technologies/pdf/review_of_materials_modelling_iv.pdf