European Commission

HORIZON 2020

WORK PROGRAMME 2014 - 2015[1]

Future and Emerging Technologies (FET)

You can find all related documents at the Participant Portal:
http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/index.html
The full Horizon 2020 FET Work Programme 2014-15 is available at:
http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/main/h2020-wp1415-fet_en.pdf

[1] Important Notice on the First Horizon 2020 Work Programme: this Work Programme covers 2014 and 2015. Due to the launching phase of Horizon 2020, parts of the Work Programme that relate to 2015 (topics, dates, budget) are provided at this stage on an indicative basis only. Such Work Programme parts will be decided during 2014.

Digital Agenda for Europe

Introduction

The mission of Future and Emerging Technologies (FET) is to turn Europe's excellent science base into a competitive advantage by uncovering radically new technological possibilities. It will help Europe to grasp leadership early on in new and emerging technology areas that promise to renew the basis for European competitiveness and growth and that will make a difference for society in the decades to come.

In order to succeed in this mission FET focusses on research beyond what is known, accepted or widely adopted and supports novel and visionary thinking to open promising paths towards powerful new technologies. In particular, it funds interdisciplinary collaborations that seek genuine cross-fertilisation and deep synergies between the broadest range of advanced sciences (physical sciences, information sciences, life sciences, environmental sciences, social sciences, humanities,...) and cutting-edge engineering disciplines (chemical, physical, biological, computational, geospatial, ...) in order to turn new knowledge and high-risk ideas into a viable basis for radically new technologies. Thus, research in FET is complementary to incremental research as well as to the European Research Council, which itself is aiming at excellent individual researchers while FET supports collaborative research projects to open up new and promising fields of research, technology and innovation.

The combination of a game-changing long-term vision and technological concreteness positions FET research between blue-sky science on the one hand, and research driven by societal challenges or by industrial competitiveness on the other. It will bring closer science, engineering and society and accelerate the transition from upstream research to technology development and transformational impact. FET actions will help to create in Europe a fertile ground for responsible and dynamic multi-disciplinary collaborations on future and emerging technologies and for kick-starting new European research and innovation eco-systems around them. These will be the seeds for future industrial leadership and for tackling society's grand challenges in new ways.

FET has three main lines of activity that contribute, each in their own way, to achieving its mission.

FET Open

FET Open supports early-stage joint science and technology research around new ideas for radically new future technologies. It will build up a diverse portfolio of targeted projects to explore a wide range of new technological possibilities, inspired by cutting-edge science, unconventional collaborations or new research and innovation practices. Early detection of promising new areas, developments and trends, along with attracting new bold-visioned and high-potential research and innovation players will be key. FET-Open represents 40% of the overall FET budget in Horizon 2020.

FET Proactive

FET Proactive nurtures emerging themes and communities by addressing a number of promising exploratory research themes with the potential to generate a critical mass of inter-related projects that, together, make up a broad and multifaceted exploration of the themes and build a European pool of knowledge and excellence. Through this line of activity FET engages in the coordinated exploration of a new theme, as well as in the consolidation of promising future technologies to be taken up by industry and society. Under its proactive calls the present work programme supports three themes (H2020-FETPROACT) selected from a wide bottom-up consultation

(see 'FET Observatory'[2]) and a fourth one (H2020-FETHPC) implementing part of the HPC strategy elaborated in the context of the HPC Public-Private Partnership by ETP4HPC[3].

- **Global Systems Science (GSS)** aims to radically improve the way in which scientific knowledge can stimulate, guide, and help evaluate policy and societal responses to global challenges like climate change, global financial crisis, global pandemics, and growth of cities - urbanisation and migration. This is a highly interdisciplinary theme with strong impacts across different sectors of policy and society.
- **'Knowing, doing and being: cognition beyond problem solving'** aims at renewing ties between the different disciplines studying knowledge, cognition and related issues (e.g., embodiment, development, insight, identity, responsibility, culture...) from various perspectives (e.g., neural, physical, social, ecological), to artificial cognitive systems beyond the level of dull task execution or repetitive problem solving. This topic has been selected to stimulate new interdisciplinary configurations and for its potential to boost future innovation potential in robotics, materials and cyber-physical systems.
- **'Quantum Simulation'** challenges the research community to develop solutions using quantum technologies that will ultimately address real world problems, with a potential for disruptive change. It focuses on quantum simulation to address problems that are fundamentally beyond the reach of classical computing, e.g. in quantum materials science or the life sciences.
- **'Towards exascale high-performance computing'** is the science and technology building block of Europe's trailblazing and timely initiative to achieve world-class extreme scale computing capabilities in terms of platforms, technologies and applications. The increasing demand for computing power from all areas of modern science and industrial engineering cannot be met without radically new architectures, new algorithmic approaches and the interdisciplinary co-design of software and applications.

FET Flagships

FET Flagships support ambitious large-scale, science-driven research aimed at grand interdisciplinary S&T challenges. Such activities require and will benefit from the alignment of European and national agendas, and provide a strong and broad basis for future technological innovation and economic application in a variety of areas, as well as novel benefits for society. The present work programme continues to support and to further develop two FET flagships (call H2020-FETFLAG):

- **The Graphene flagship** pushes the science and technologies for a new class of material beyond the era of silicon, bringing graphene and related 2D-materials, from academic labs to industry, manufacturing and society.
- **Human Brain Project (HBP)** aims to simulate and better understand the Human Brain in order to develop new diagnostic tools and treatments for brain diseases, as well as new classes of low-energy technologies with brain-like intelligence, such as neuromorphic computing.

[2] http://cordis.europa.eu/fp7/ict/fet-proactive/fetconsult2012-topics_en.html

[3] http://www.etp4hpc.eu

FET aims at shaping the future technology landscape and European thought-leadership on new and emerging technologies. The combination of a bottom-up spirit and a broadly based participatory agenda-setting assures that FET explores radically new avenues while remaining sensitive to future needs from industry and society. By promoting interdisciplinary collaboration that go well beyond the strictly technological and 'hard' scientific disciplines, FET promotes dialogue and cooperation between science, industry, citizens and policy makers on how to turn new technological possibilities into an opportunity for industry and a benefit for society. This will boost long-term innovation potential in Europe both from the abundance of novel ideas and the diversity of actors ready to take them forward. Along the same line, FET will pay attention to issues such as gender, age and culture, in the research topics and teams it promotes as well as in its public engagement, aware that this can offer new perspectives, posing new questions, and opening new areas of investigations in, for instance, life sciences, engineering and technological development, environment, food and nutrition, health and medicine, or transport.

The silo-breaking research collaborations in FET will also improve readiness across Europe to take up new research and innovation practices for making leading-edge science and technology research more open, creative and closer to society, especially through 'digital science', promoting for instance open scientific data, advanced simulation, and the use of platforms for open collaboration or for better involvement of the general public in research. These are essential tools for building operational links between science, technology, innovation and society, as well as across disciplines, so that even the most advanced results can find their way to stimulate industrial leadership and for addressing societal challenges.

FET research is well placed for global collaborations that can raise the level of excellence and accelerate the impact from global alliances. Thus, participation of excellent non EU partners in FET activities, whenever necessary and essential, is welcome.

The projects funded under the Future and Emerging Technologies part of the Work Programme 2014-15 will participate in the Pilot on Open Research Data in Horizon 2020 in line with the Commission's Open Access to research data policy for facilitating access, re-use and preservation of research data. Projects have the possibility to opt out of the pilot. A related new element in Horizon 2020 is the use of Data Management Plans (DMPs) detailing what data the project will generate, whether and how it will be exploited or made accessible for verification and re-use, and how it will be curated and preserved. The use of a Data Management Plan is required for projects participating in the Open Research Data Pilot. Further guidance on the Open Research Data Pilot is made available on the Participant Portal.

FET OPEN call: novel ideas for radically new technologies

This call aims to support early-stage joint science and technology research for radically new future technological possibilities. The call is entirely non-prescriptive with regards to the nature or purpose of the technologies that are envisaged and thus targets mainly the unexpected. A bottom-up selection process will build up a diverse portfolio of projects. In order to identify and seize opportunities of long-term benefit for citizens, the economy and society, the early detection of promising new areas, developments and trends, wherever they come from, will be essential. The call also seeks for coordination and support activities to turn Europe into the best place in the world for responsible collaborative research on future and emerging technologies that will make a difference for society in the decades to come.

Proposals are invited against the following topics:

- FETOPEN-1-2014: FET-Open research projects
- FETOPEN-2-2014: Coordination and Support Activities
- FETOPEN-3-2015: Coordination and Support Activities

FETOPEN-1-2014: FET-Open research projects

Specific challenge

Supporting a large set of early stage, high risk visionary science and technology collaborative research projects is necessary for the successful exploration of new foundations for radically new future technologies. Nurturing fragile ideas requires an agile, risk-friendly and highly interdisciplinary research approach, expanding well beyond the strictly technological disciplines. Recognising and stimulating the driving role of new high-potential actors in research and innovation, such as women, young researchers and high-tech SMEs, is also important for nurturing the scientific and industrial leaders of the future.

Scope

Proposals are sought for collaborative research with all of the following characteristics:

- **Long-term vision**: the research proposed must address a new, original or radical long-term vision of technology-enabled possibilities that are far beyond the state of the art and currently not anticipated by technology roadmaps.
- **Breakthrough S&T target**: research must target scientifically ambitious and technologically concrete breakthroughs that are arguably crucial steps towards achieving the long-term vision and that are plausibly attainable within the life-time of the proposed project.
- **Foundational**: the breakthroughs that are envisaged must be foundational in the sense that they can establish a basis for a new line of technology not currently anticipated.
- **Novelty**: the research proposed must find its plausibility in new ideas and concepts, rather than in the application or incremental refinement of existing ones.
- **High-risk**: the potential of a new technological direction depends on a whole range of factors that cannot be apprehended from a single disciplinary viewpoint. This inherent high-risk has to be countered by a strongly interdisciplinary research approach, where needed expanding well beyond the strictly technological realm.
- **Interdisciplinary**: the proposed collaborations must be interdisciplinary in the sense that they go beyond current mainstream collaboration configurations in joint science- and technology research, and that they aim to advance different scientific and technological disciplines together and in synergy towards a breakthrough.

This call is open to early-stage research on any new technological possibility.

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

Proposals must aim at one of the following two impacts:

- Initiating a radically new line of technology by establishing Proof-of-Principle of a new technological possibility and its new scientific underpinning, or
- Kick-starting an emerging innovation eco-system of high-potential actors around a solid baseline of feasibility and potential for a new technological option, ready for early take- up.

The active involvement of new and high-potential research and innovation players, which may become the European scientific and technological leaders of the future, is encouraged. Impact is also sought in terms of take up of new research and innovation practices and, more generally, from making leading-edge science and technology research more open, collaborative, creative and closer to society.

Type of action

Research and Innovation Actions

Indicative budget distribution

- EUR 77 million (for deadline 30/09/2014)[4]
- EUR 38.5 million (for deadline [31/03/2015])[5, 6]
- EUR 38.5 million (for deadline [29/09/2015])[6, 7]

Call

H2020-FETOPEN-2014/2015

[4] Subject to the availability of the appropriations provided for in the draft budget for 2014 after the adoption of the budget for 2014 by the budgetary authority or if the budget is not adopted as provided for in the system of provisional twelfths.

[5] The budget amounts are indicative and will be subject to a separate financing decision to cover the amounts to be allocated for 2015.

[6] The deadlines provided in brackets are indicative and subject to a separate financing decision for 2015.

[7] Out of which EUR 26.3 million from the 2016 budget. The budget amounts are indicative and will be subject to a separate financing decision to cover the amounts to be allocated for 2016.

FETOPEN-3-2015: Coordination and Support Activities

Specific challenge

The challenge is to make Europe the best place in the world for collaborative research on future and emerging technologies that will renew the basis for future European competitiveness and growth, and that will make a difference for society in the decades to come.

Scope

Proposals shall address one of the following topics:

- **FET Exchange**: structuring an emerging FET-relevant topic and the interdisciplinary communities around it. This shall include research roadmapping, stimulating learning and exchange (possibly with related initiatives worldwide) involving the appropriate range of disciplines and actors such as young researchers and high-tech SMEs, and broader stakeholder engagement.
- **FET Take-Up**: actions for stimulating take-up of FET research results towards impact and innovation, in ways that are complementary to and beyond the capacity of single research projects. Examples include outreach to investors and entrepreneurs, use of unconventional channels (like NGOs or artists), or targeting of new audiences and purposes (e.g. for social innovation, global development or peace).

The Commission considers that proposals requesting a contribution from the EU of between EUR 0.3 and 0.5 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

- European thought-leadership on new and emerging technologies with a strong engagement of scientists, citizens, innovators and policy makers.
- Improved long-term innovation potential in Europe both from the abundance of novel ideas and the range of actors ready to take them forward.
- Improved readiness across Europe to engage in silo-breaking research collaboration and to take up new research and innovation practices.
- Increased take-up of long-term science and technology research results.

Type of action

Coordination and Support Actions

Indicative budget distribution

- EUR 1.5 million (for deadline [31/03/2015])[9, 10]
- EUR 1.5 million (for deadline [29/09/2015])[9, 10]

Call

H2020-FETOPEN-2014/2015

[9] The budget amounts are indicative and will be subject to a separate financing decision to cover the amounts to be allocated for 2015.

[10] The deadlines provided in brackets are indicative and subject to a separate financing decision for 2015.

Indicative Timetable and Budget

Objective	Type of actions	Submission deadline[28, 29]	Budget[30] (EUR million)
FETOPEN-1: FET-Open research projects	RIA	- 30/09/2014 - [31/03/2015] - [29/09/2015]	77 38.5 38.5
FETOPEN-2: Coordination and Support Activities	CSA	30/09/2014	3
FETOPEN-3: Coordination and Support Activities	CSA	- [31/03/2015] - [29/09/2015]	1.5 1.5
FETPROACT-1: Global Systems Science (GSS)	RIA	01/04/2014	10
FETPROACT-2: Knowing, doing, being: cognition beyond problem solving	RIA	01/04/2014	15
FETPROACT-3: Quantum simulation	RIA	01/04/2014	10
FETHPC-1: HPC Core Technologies, Programming Environments and Algorithms for Extreme Parallelism and Extreme Data Applications	RIA	25/11/2014	93.4
FETHPC-2: HPC Ecosystem Development	CSA	25/11/2014	4
FETFLAG-1: Framework Partnership Agreement	FPA	10/04/2014	Non-applicable
FETFLAG-2: Policy environment for FET Flagships	CSA	10/04/2014	1.6
OTHER ACTIONS: FET Flagship Core Projects 2a. Graphene 2b. Human Brain Project	RIA action under the specific FPA	Second quarter of 2015	 89 89
OTHER ACTIONS: Study contract on Digital Science	Public procurement	First quarter of 2014	0.2

Funding schemes

RIA	Research and Innovation Action
CSA	Coordination and Support Action
FPA	Framework Partnership Agreement

[28] The Director-General responsible may delay this deadline by up to two months.

[29] The deadlines provided in brackets are indicative and subject to a separate financing decision for 2015.

[30] Subject to the availability of the appropriations provided for in the draft budget for 2014 after the adoption of the budget for 2014 by the budgetary authority or if the budget is not adopted as provided for in the system of provisional twelfths.
The budget amounts are indicative and will be subject to a separate financing decision to cover the amounts to be allocated for 2015.

FET Eligibility and Evaluation criteria

Elegibility and admissibility conditions

The conditions are described in parts B and C of the General Annexes to the work programme, with the following additions:

FETOPEN-1, FETPROACT-1, FETPROACT-2, FETPROACT-3	Part B is strictly limited to 16 A4 pages and shall consist of: • A single A4 title page with acronym, title and abstract of the proposal. • Maximum 15 A4 pages consisting of an S&T section (section 1), an Impact section (section 2) and an Implementation section (section 3).
FETOPEN-2	For each of the scope items a), b), d), e) and f) up to one proposal will be funded.

Specific evaluation criteria and evaluation procedure applicable to FET-Open and FET-Proactive Emerging themes and communities calls (FETOPEN and FETPROACT)[31]

FET support interdisciplinary research positioned between research driven by science and research driven by societal challenges or by industrial competitiveness. FET research aims at accelerating the transition from upstream research to technology development. Due to this specific nature of FET research, FET applies specific evaluation criteria.

Thresholds and weights are set for each criterion, as indicated in the table below. A proposal failing to achieve any of these threshold scores will not be funded.

[31] For FET Proactive Towards exascale high performance computing call (FETHPC), the criteria, scoring and threshold are described in part H of the General Annexes to the work programme. The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

Evaluation criteria

	1. Excellence [32]	2. Impact	3. Quality and efficiency of the implementation
Research and Innovation Actions (FETOPEN-1, FETPROACT-1, FETPROACT-2, FETPROACT-3)	• Clarity of targeted breakthrough and its specific science and technology contributions towards a long-term vision. • Novelty, level of ambition and foundational character. • Range and added value from interdisciplinarity. • Appropriatness of the research methods.	• Importance of the new technological outcome with regards to its transformational impact on technology and/or society. • Quality of measures for achieving impact on science, technology and/or society. • Impact from empowerment of new and high potential actors towards future technological leadership	• Quality of the workplan and clarity of intermediate targets. • Relevant expertise in the consortium. • Appropriate allocation and justification of resources (person- months, equipment, budget).
	Threshold: 4/5 **Weight: 60%**	**Threshold: 3.5/5** **Weight: 20%**	**Threshold: 3/5** **Weight: 20%**
Coordination and Support Actions (FETOPEN-2, FETOPEN-3)	• Clarity of objectives. • Contribution to the co-ordination and/or support of high-risk and high-impact research, for new or emerging areas or horizontally. • Appropriateness of the coordination and/or support activities.	• Transformational impact on the communities and/or practices for high-risk and high-impact research. • Appropriateness of measures for spreading excellence, use of results, and dissemination of knowledge, including engagement with stakeholders.	• Quality of workplan and management. • Relevant expertise in the consortium. • Appropriate allocation and justification of resources (person- months equipment, budget).
	Threshold: 3/5 **Weight: 40%**	**Threshold: 3/5** **Weight: 40%**	**Threshold: 3/5** **Weight: 20%**

Specific evaluation procedure applicable to FET-Open and FET-Proactive Emerging themes and communities calls (FETOPEN and FETPROACT)

At consensus stage, the consensus score for each evaluation criteria will be the median of the corresponding scores attributed by the individual evaluators and the consensus report will comprise a collation of the comments from individual reports, or extracts from them.

The procedure for setting a priority order for proposals with the same score is given in part H of the General Annexes.

The full evaluation procedure is described in the relevant guide associated with this call.

A single stage submission procedure will be followed.

[32] Excellence of the S&T section.