



H2020

Future and Emerging Technologies (FET)

ICT-Energy Workshop, Bristol, September 15th 2015

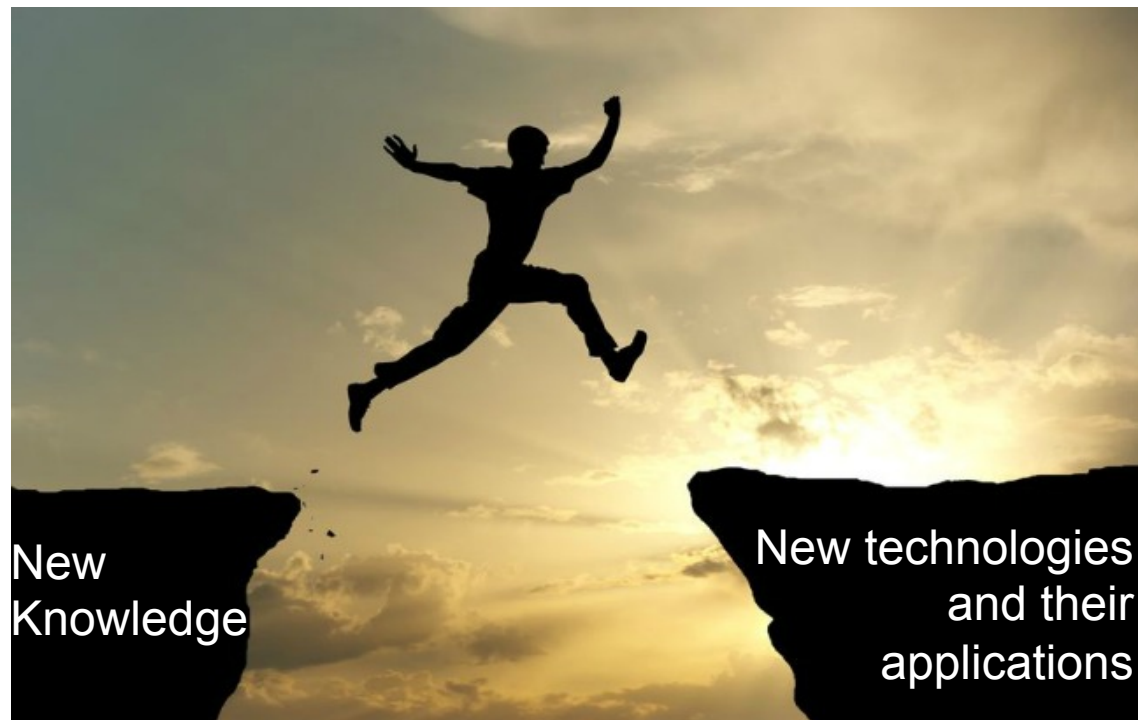


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FET mission



- To turn Europe's excellent science base into a competitive advantage by uncovering radically new technological possibilities
- To turn Europe into the best place for collaborative research and innovation in future and emerging technologies



FET Gatekeepers



Long-term vision: *a new, original or radical long-term vision of technology-enabled possibilities going far beyond the state of the art*

Breakthrough S&T target: *scientifically ambitious and technologically concrete breakthroughs plausibly attainable within the life-time of the project.*

Foundational: *the breakthroughs must be foundational in the sense that they can establish a basis for a new line of technology not currently anticipated.*

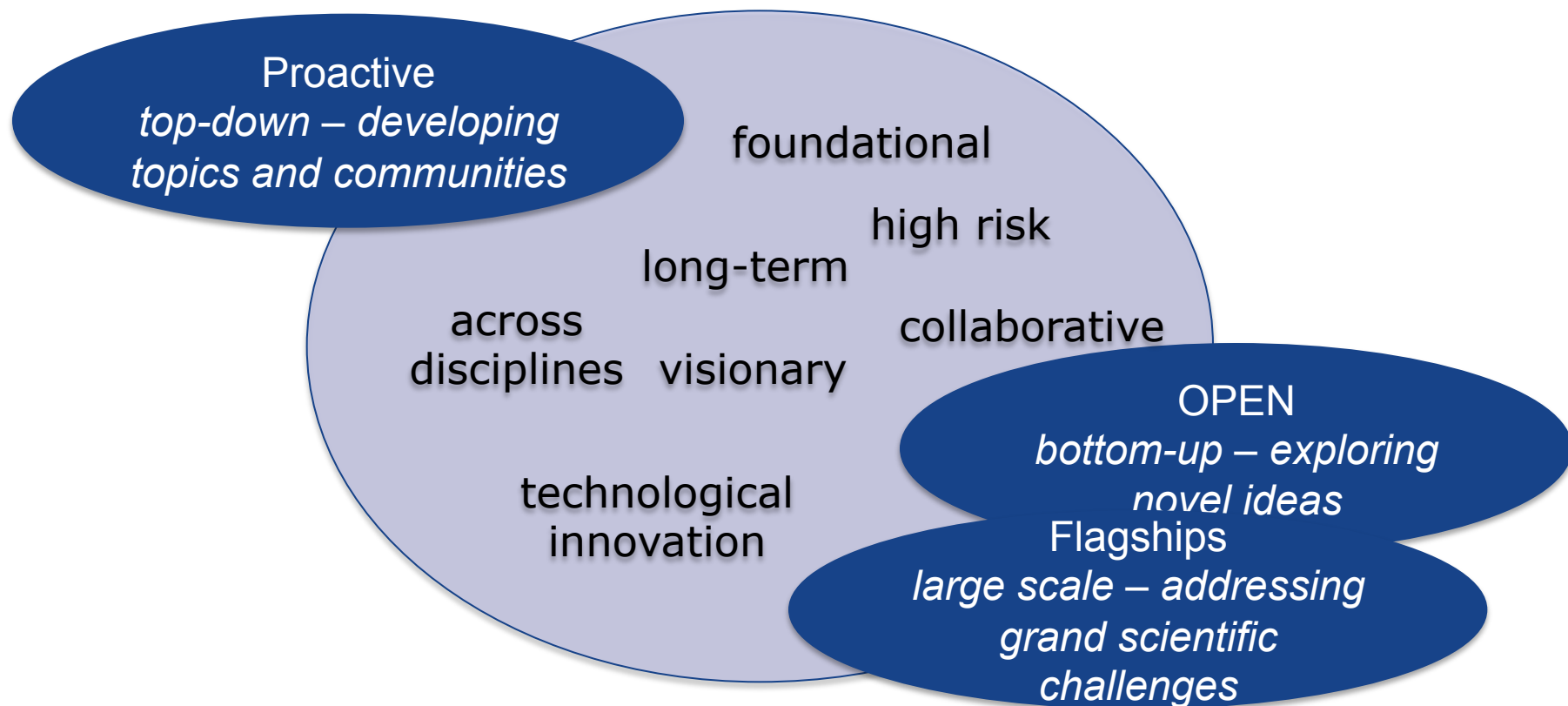
Novelty: *new ideas and concepts, rather than the application or incremental refinement of existing ones.*

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 go beyond current mainstream collaboration configurations in joint S&T research, and must aim to advance different scientific and technological disciplines together and in synergy towards a breakthrough.*

Different initiatives with shared values





FET in



320 projects

Open – Proactive – Flagships

2500 participations

798 unique partners

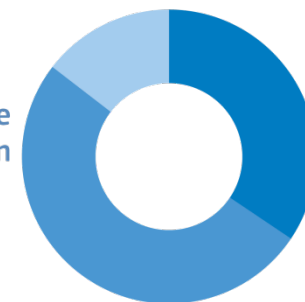
122 SMEs participations
(4.8%)

Total EC funding received per FET scheme

Flagships
≈€119.9m

Proactive
≈€420.6m

Open
≈€283.6m



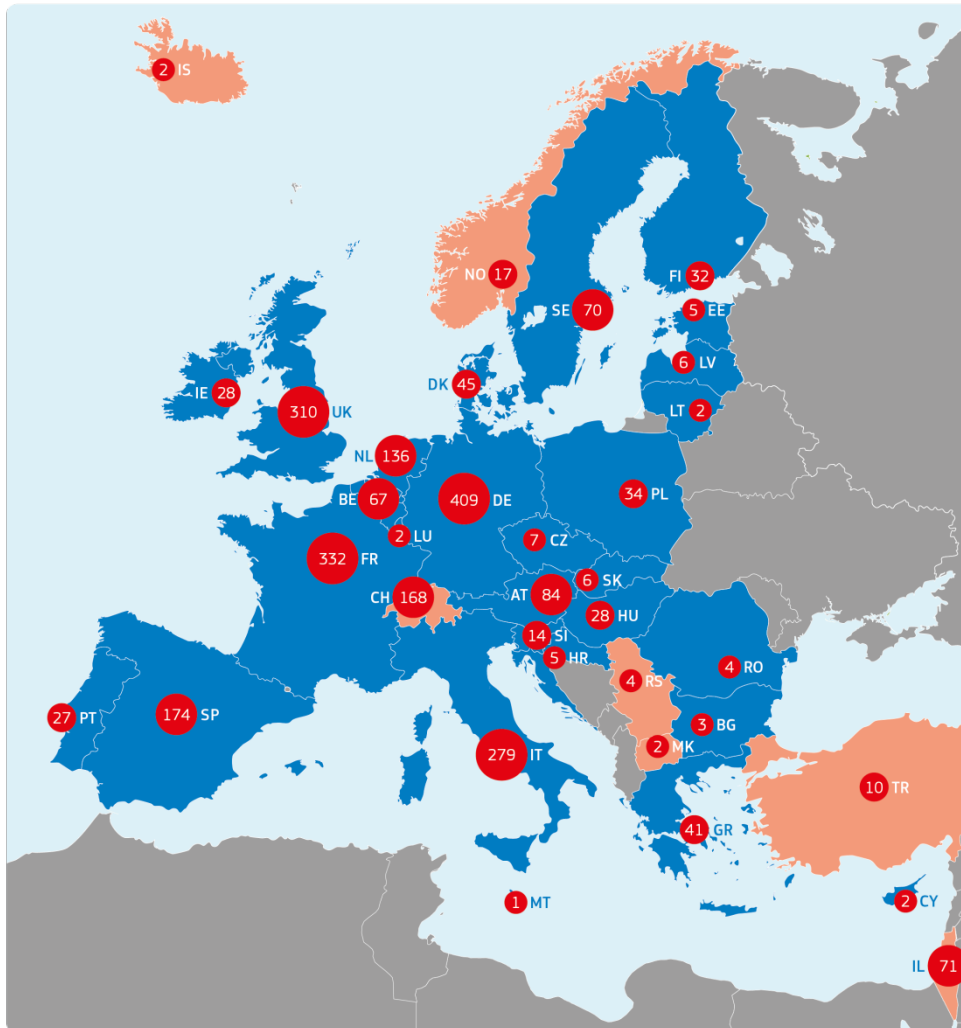
EU28
≈ €702.6 million

Associated countries
≈€115.5 million

Number of participations
per country



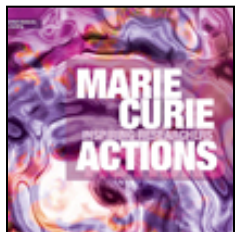
other countries (73 participations ≈€6 million)



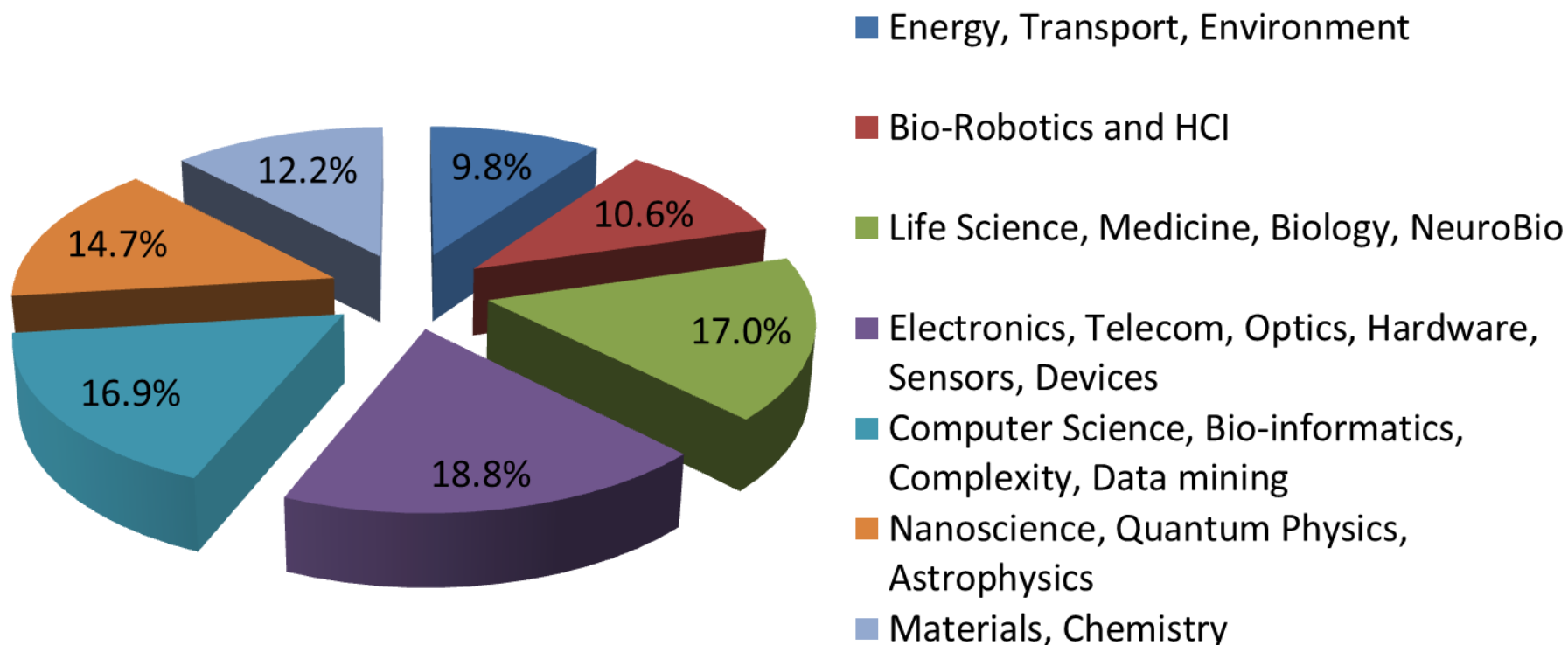


A new level of ambition

- *A European lighthouse of thought leadership in collaborative research on future and emerging technologies*
- *New mandate, not limited to ICT*
- *New large-scale partnering initiatives complementing small and medium scale activities*
 - FET Flagships: Graphene and Human Brain Project
 - High-Performance Computing (Public-Private Partnership - cPPP)



Overview of topics covered



first call in 2014: 640 eligible RIA proposals - 77M€ budget - success rate ~3,75%



10 topics from FET Pro-active consultation

Future technologies for societal challenges

- **Being human in a technological world**
- **New science for a globalised world**

Biotech for better life

- **Intra- and inter-cell bio-nano-chem technologies**
- **Bio-electronic medicines and therapies**
- **Cognitive neuro-technologies**

Disruptive information technologies

- **New computing paradigms and their technologies**
- **Quantum engineering**
- **Hybrid opto-electro-mechanical devices at the nano-scale**

New technologies for Energy and Materials

- **Ecosystem engineering**
- **Complex bottom-up construction**

HPC strategy



Integrated strategy combining three elements:

**Access to HPC
resources**



Exascale systems



HPC applications



complemented with training, education and skills development in HPC

Application areas:



FETHPC and CoEs

High-energy physics

Satellite systems

Astrophysics

Earth Sciences

Material science

Fusion

Numerical weather prediction

Spiking neural networks

Health care

Smart City

Global system science

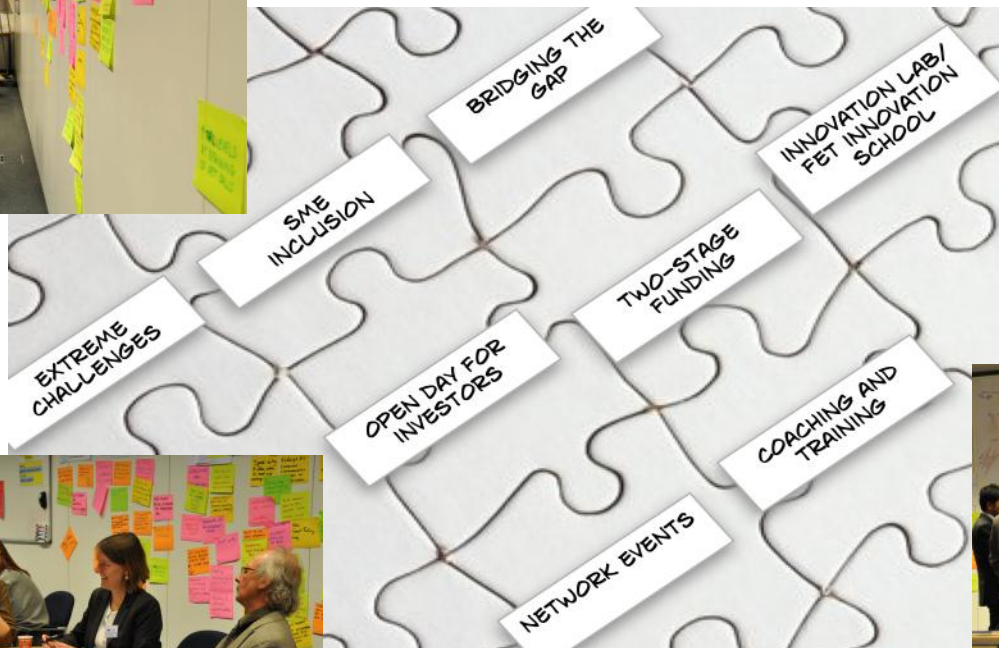
Finance



Headline research challenges towards exascale (FETHPC 2016/2017 Calls)

- **Co-design** of HPC systems and applications (*big projects*)
- **Transition to exascale computing** (*smaller focused projects*)
 - High productivity programming environments for exascale
 - Exascale system software and management
 - Exascale I/O and storage in the presence of multiple tiers of data storage
 - Supercomputing for Extreme Data and emerging HPC use modes
 - Mathematics and algorithms for extreme scale HPC systems and applications working with extreme data
- Exascale **Ecosystem Development** (*CSAs*)

Brain-storming on innovation



Workshop organized in February 2015



Prospective actions on innovation

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.

FET Innovation Launchpad

short and focused 'top-up' actions to take a FET result 'out of the lab' towards exploitation.

FET Innovation Greenhouse

stimulate entrepreneurship from incubator networks tailored to the specific nature of FET & support to FET innovation launch pad.

Initiatives are also planned in the frame of HPC and Flagships.

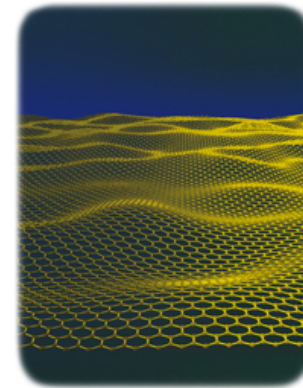
Graphene FET Flagship

Graphene, is a 2D material , a single layer of carbon atoms, stronger than diamond, yet lightweight and flexible and an exceptional electricity conductor.

The Graphene Flagship will bring graphene, and related 2D materials, **from academic labs to industry, manufacturing and society.**

Examples Applications:

- ✓ electronic paper; bendable smartphones; enhanced solar cells and batteries; lighter and more energy efficient airplanes ...
- ✓ On the longer term, graphene is expected to give rise to new computers and revolutionary medical applications such as artificial retinas.



*Artistic impression of a corrugated graphene sheet
Credit: Jannik Meyer*

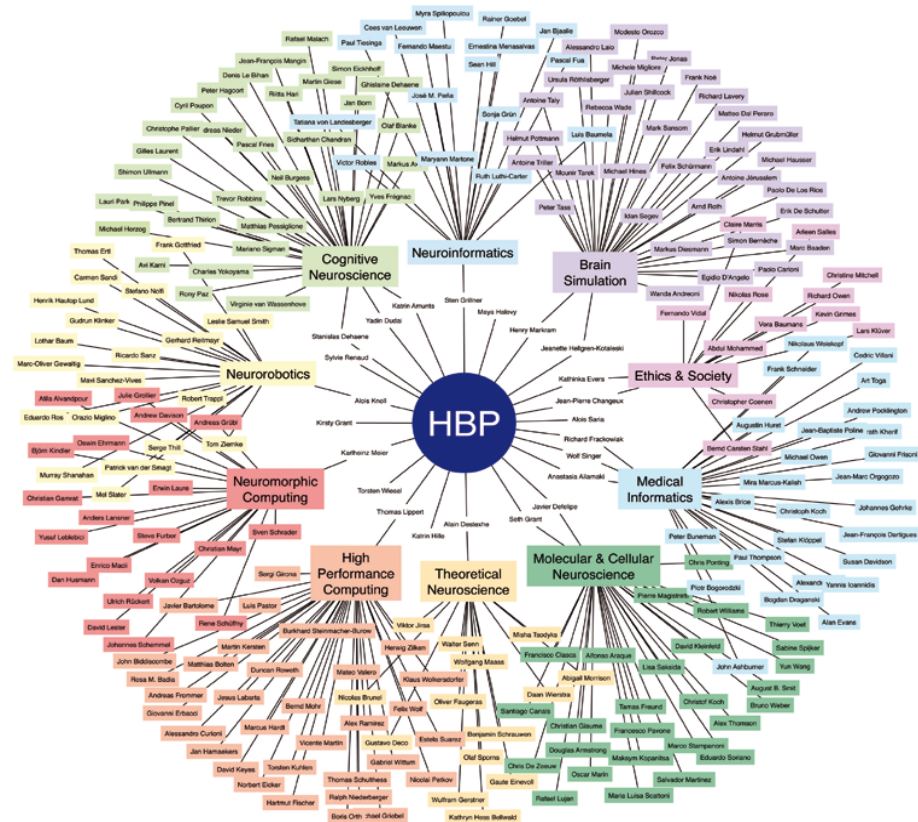


The Human Brain Project

HBP will create the world's largest **experimental facility for developing the most detailed models of the brain** (from genes to mind), for studying how the human brain works and ultimately for simulating and developing personalised treatment of brain diseases.

This research lays the scientific and **technical foundation for medical progress**: identifying new drug targets and treatment, in response to the urgent need to combat brain diseases and their associated costs to society.

HBP will also produce brain-inspired **'neuromorphic' computing** systems that could drastically reduce power-consumption for super-computers and enhance robots.





Public-Private Partnerships in H2020

*Horizon 2020 may be implemented through PPPs where all the partners concerned commit to support the **development and implementation of R&I activities of strategic importance to the Union.***

cPPPs launched:

- Advanced 5G networks
- Big Data Value Chain (January 2015)
- Energy-efficient Buildings
- European Green Vehicles Initiative
- Factories of the Future
- High Performance Computing (started 1st January 2014)
- Photonics
- Robotics
- Sustainable Process Industry

ICT & energy across LEIT

A new generation of components and systems

ICT 2 – 2014: Smart System Integration

R&D, prototyping and testing, manufacturing and industrialisation of smaller, smarter (predictive, reactive and cognitive) and **energy autonomous Smart Systems**...

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

Advanced Computing

ICT 4 – 2015: Customised and low power computing

Next generation servers, micro-server and highly parallel embedded computing systems based on **ultra-low power architectures**: The target is highly performing low-power low-cost micro-servers, using cutting-edge technologies... **Reduction of energy consumption of servers by 2 orders of magnitude as compared to state of the art in 2013.**

Future Internet

ICT 6 – 2014: Smart optical and wireless network technologies

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... ***Reduce energy consumption of basic infrastructures by a factor of about 10.***

ICT 7 – 2014: Advanced Cloud Infrastructures and Services

Research will be oriented towards new computational and data management models (at both infrastructure and services levels) that respond to the advent of faster and more efficient machines, rising heterogeneity of access modes and devices, ***demand for low energy solutions.***

ICT 14 – 2014: Advanced 5G Network Infrastructure for the Future Internet

Reduction of energy consumption, significant bandwidth increase in current mobile bands and end-to-end latency are key drivers.

10 times lower energy consumption for low power Machine type communication.

Micro- and nano-electronic technologies, Photonics

ICT 25 – 2015: Generic micro- and nano-electronic technologies

Focus will be on high mobility substrates for performance improvement, **new switch architectures for reduced energy dissipation**,...

Design for advanced nanoelectronics technologies. Focus will be on **design-technology solutions for energy efficiency**, high reliability and robustness.



ICT 26 – 2014: Photonics KET

Optical communication for data centres: Low-cost, **energy-efficient photonic devices** supporting radically new system and network architectures...

ICT Cross-Cutting Activities

ICT 32 – 2014: Cybersecurity, Trustworthy ICT

Projects have to demonstrate a **net increase in performance, or reduction in energy or power consumption**, compared to state-of-the-art approaches and have to validate the proposed technology in realistic application scenarios.

Breaking the optical transmission barriers Inducement Prize

Such breakthrough solutions are required to meet the imminent bandwidth demand explosion. They may be related *inter alia* to increasing the capacity, reach, spectrum range and/or spectral efficiency of point-to-point optical fibre transmission (sub-)systems, while **also taking into account the aspects of energy efficiency** and economic viability of such systems.



Ready to join the over 4500 ICT enthusiasts expected to attend ICT2015?



Thank you for your attention

About FET: <http://ec.europa.eu/digital-agenda/FET>

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