Le programme Technologies Futures et Emergentes (FET): opportunités de financement en 2019 et 2020

Virginie Sivan, MESRI

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Agenda

❑ FET et l'Esprit FET : d'Horizon 2020 à Horizon Europe

❑ FET OPEN

❑ FET proactive

❑ Future Battery Technologies
a large scale FET initiative on future battery technologies

❑ Instrument MRSEI (ANR)

FET et l'Esprit FET
d'Horizon 2020 à Horizon Europe

Historique de FET

❑ Un programme initié en 1993

❑ Géré par la DG-CONNECT

❑ Ouvert à tous types de technologies sous Horizon 2020
(limité auparavant aux TIC)

The sower, Vincent van Gogh

''FET activities aim to create in Europe a **_fertile ground_** for responsible and dynamic **_multi-disciplinary collaborations_** on **_future technologies_** and for kick-starting new European research and innovation eco-systems around them. These will be **_SEEDS_** for **_future industrial leadership_** and for tackling society's grand challenges **_in new ways_**.''

➔ **Recherche fondamentale**

➔ **Objectif moyen/long-terme (≈ 10 ans)**

« L'Esprit FET »

Les ambition du programme **Technologies futures et émergentes**:

❑ **Transformer l'excellence scientifique** de l'Europe en un **avantage compétitif**

❑ Faire de l'Europe **l'espace le plus attractif** pour la **recherche collaborative et interdisciplinaire** dans le domaines des technologies futures et émergentes

New knowledge — FET — New technologies and their applications
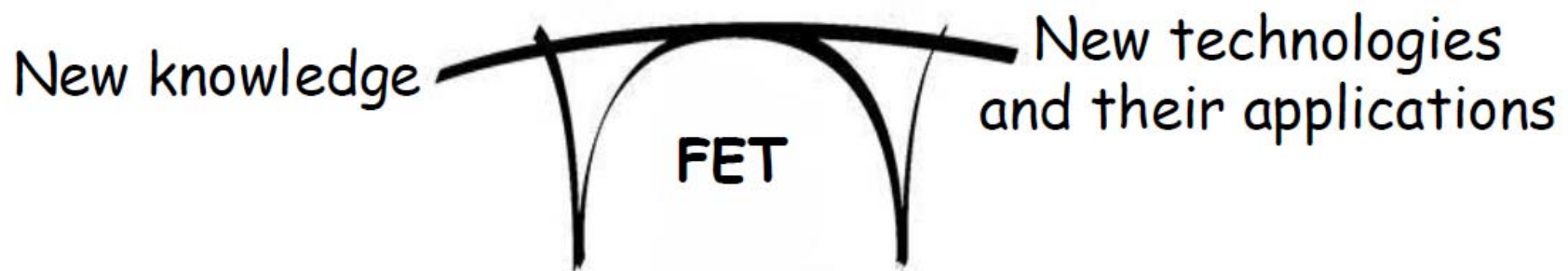
L'esprit "FET" (suite)

- Recherche exploratoire visant des **directions radicalement nouvelles** et **à haut risque** émergeant de la science et de l'ingénierie d'avant garde.

- Recherche **en rupture**, au-delà des connaissances et de ce qui est largement adopté

- Idées **visionnaires** (long terme) pour ouvrir des voies prometteuses vers des **technologies encore inexplorées**.

- Recherche **interdisciplinaire** rapprochant la science et l'ingénierie, et se positionnant entre défis scientifiques, défis sociétaux et compétitivité industrielle.

TOUS ces critères doivent être présents dans un projet FET

Les Instruments FET

Exploration de nouvelles idées

Dév. thèmes & commun.

Grands défis S&T

Niveau de complexité et taille du consortium

Innovation Launchpad

FET Open

HPC

FET Proactive

FET Flagships

Un programme ouvert : projets collaboratifs blancs (sans contrainte thématique)

Projets : 3 M€

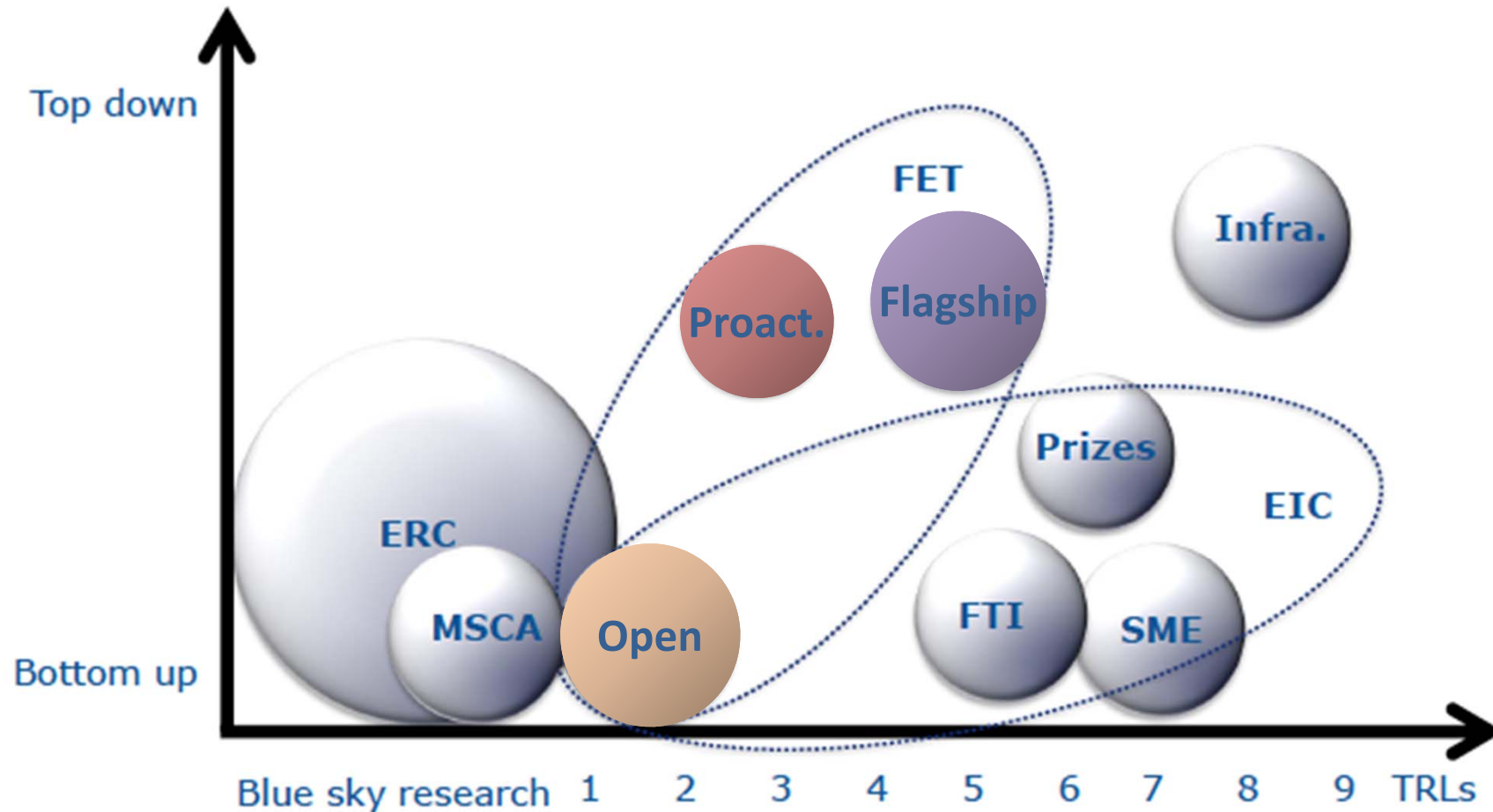**Un programme thématique :** développement de communautés dans un domaine ciblé

Projets : **4-7 M€**

Un programme stratégique : fédération d'acteurs sur des priorités techno. de l'UE
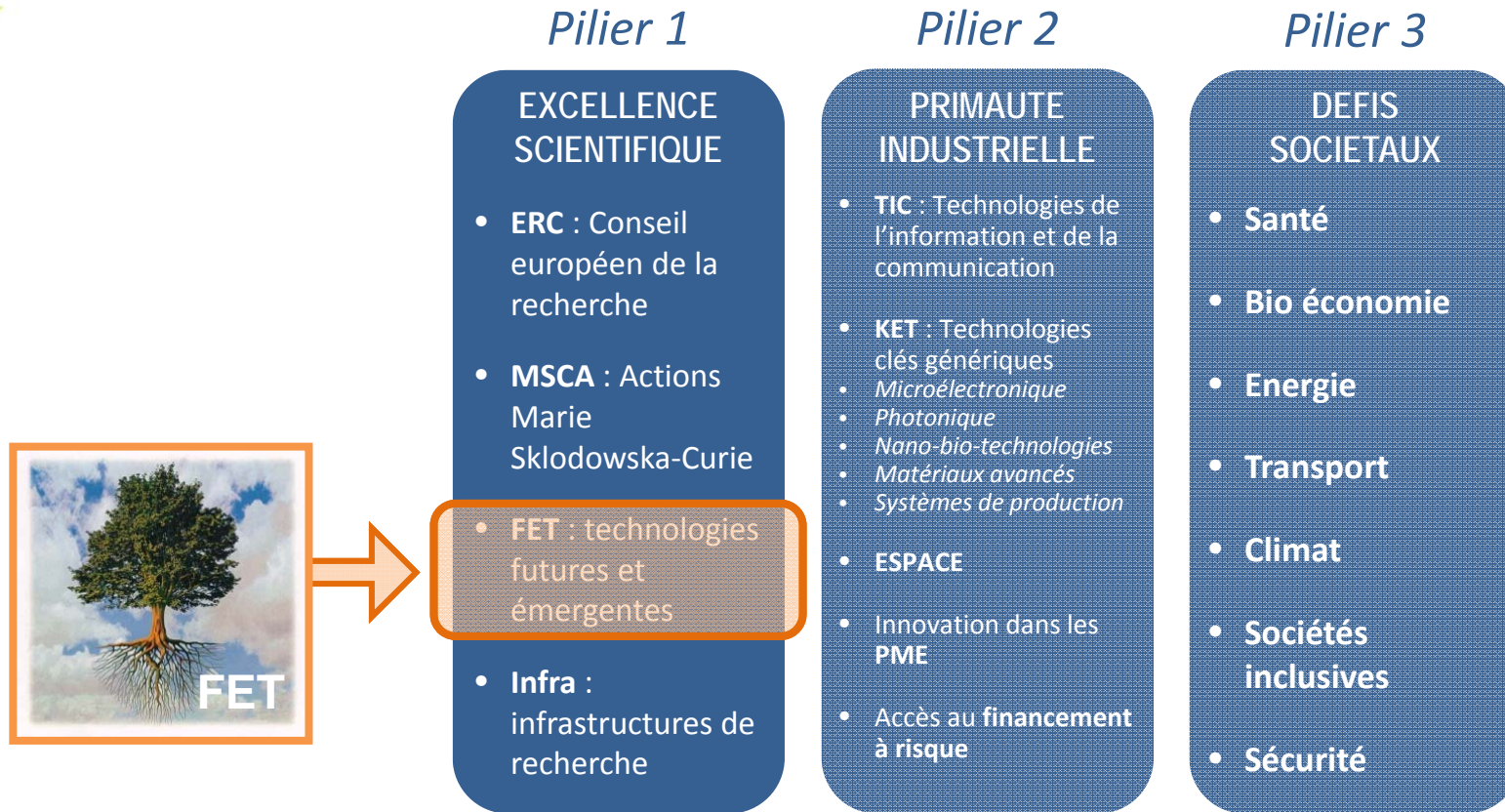
Projets : **500 M€**

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FET : des TRLs Intermédiaires

FET dans Horizon 2020

Pilier 1

EXCELLENCE SCIENTIFIQUE

- **ERC** : Conseil européen de la recherche
- **MSCA** : Actions Marie Sklodowska-Curie
- **FET** : technologies futures et émergentes
- **Infra** : infrastructures de recherche

Pilier 2

PRIMAUTE INDUSTRIELLE

- **TIC** : Technologies de l'information et de la communication
- **KET** : Technologies clés génériques
  - *Microélectronique*
  - *Photonique*
  - *Nano-bio-technologies*
  - *Matériaux avancés*
  - *Systèmes de production*
- **ESPACE**
- Innovation dans les **PME**
- Accès au **financement à risque**

Pilier 3

DEFIS SOCIETAUX

- **Santé**
- **Bio économie**
- **Energie**
- **Transport**
- **Climat**
- **Sociétés inclusives**
- **Sécurité**

FET

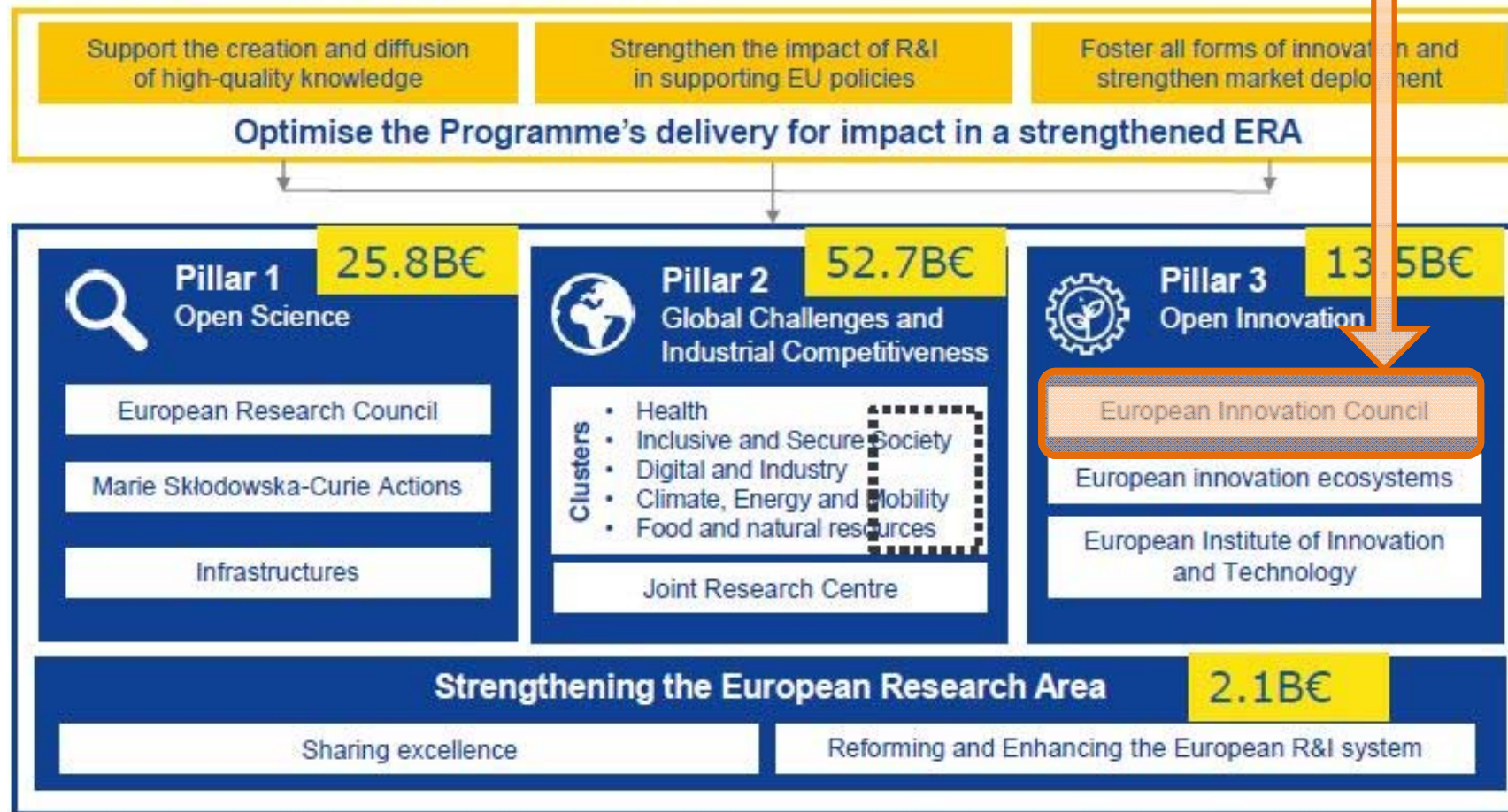« **Un terrain fertile pour des collaborations multidisciplinaires** »

Dynamiser l'écosystème européen de R&I : des graines pour le futur

FET dans Horizon Europe

Specific objectives of the Programme

Support the creation and diffusion of high-quality knowledge	Strengthen the impact of R&I in supporting EU policies	Foster all forms of innovation and strengthen market deployment

Optimise the Programme's delivery for impact in a strengthened ERA

Pillar 1 Open Science — 25.8B€	**Pillar 2** Global Challenges and Industrial Competitiveness — 52.7B€	**Pillar 3** Open Innovation — 13.5B€
European Research Council	Clusters: • Health • Inclusive and Secure Society • Digital and Industry • Climate, Energy and Mobility • Food and natural resources	European Innovation Council
Marie Skłodowska-Curie Actions		European innovation ecosystems
Infrastructures	Joint Research Centre	European Institute of Innovation and Technology

Strengthening the European Research Area — 2.1B€

Sharing excellence	Reforming and Enhancing the European R&I system

Les instruments FET dans Horizon Europe

➔ **EIC** ➔ **Missions / Clusters**

Exploration de nouvelles idées

Dév. thèmes & commun.

Grands défis S&T

~~HPC~~

FET Open

FET Proactive

FET Flagships

Un programme ouvert : projets collaboratifs blancs (sans contrainte thématique)

Projets : 3 M€

Un programme thématique : développement de communautés dans un domaine ciblé

Projets : **4-7 M€**

Un programme stratégique : Human Brain Project Graphene Quantum technologies Batteries 2030 etc. Projets : **500 M€**

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Transition 2018-2020 : FET dans l'EIC Pilot (2018-2020)

€3 billion-pilot package to support bottom-up ideas

PATHFINDER Pilot	ACCELERATOR Pilot
€ 845 million **400 projects**	**€ 2,100 million** **XXXX projects**
FET OPEN + FET Proactive Future and Emerging Technologies (grant-only)	**SME Instrument Phase 2 / Fast Track to Innovation (FTI)** (grant-only) **OR** **Blended finance** (grant + equity)
Visionary idea for developing radical and innovative technologies	Radically new, highly risky ideas commercially viable and with a potential to scale up

Coaching, mentoring and business acceleration services for all SMEs

EIC Horizon Prizes + Support actions
€50 million

- The funding for high risk, high gain multidisciplinary research is continuing in H2020 under Pathfinder FET part of the EIC Enhanced pilot

- Pathfinder FET Open success rate is strongly improving with around 11% in the last cut-off and most probably will improve even more as the budget is strongly increasing.

- In Horizon Europe the advanced multidisciplinary research will continue to be supported under EIC Pathfinder

We want to see THE BEST people with THE BEST multidisciplinary ideas coming forward.

10

Exploration de nouvelles idées · Dév. thèmes & commun. · Grands défis

Niveau de complexité et taille du consortium

FET Open — Innovation Launchpad
Un programme ouvert
Projets : 3 M€

FET Proactive — HPC
Un programme thématique
Projets : 4-7 M€

FET Flagships
Un programme stratégique
Projets : 500 M€
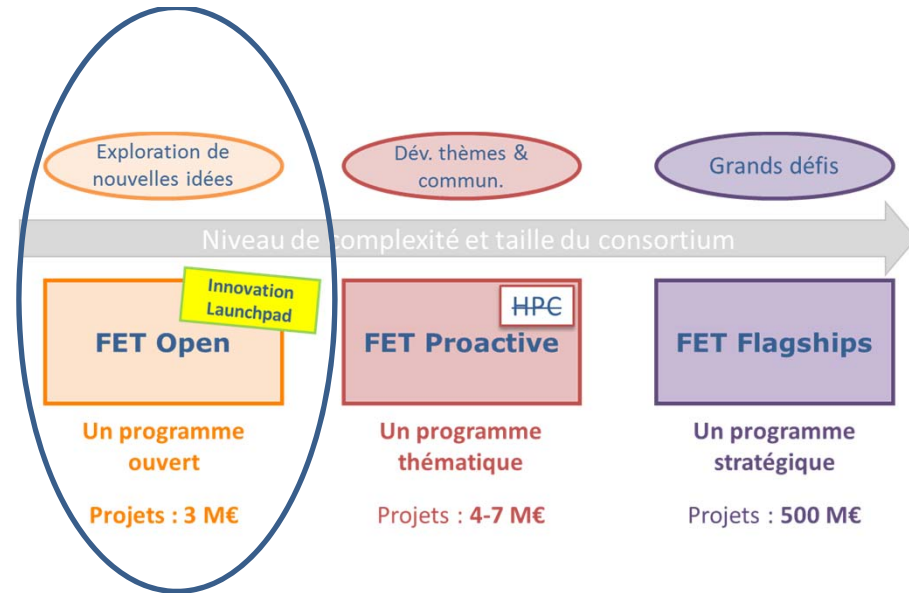
Les appels 2019-2020 de l'EIC Pathfinder Pilot
FET Open

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FET Open : Technologies Futures et émergentes

❑ Programme **non thématique** (1 à 2 appels par an / soumission en 1 étape)

❑ Projets RIA (Research and Innovation Action) ➡ **Recherche collaborative**

> Consortium : au moins 3 partenaires de 3 Etats membres ou associés
>
> En moyenne : 6 partenaires

Consortium resserré

❑ Budget: 3 à 4 M€

❑ **Recherche fondamentale** (exploratoire) d'excellence inspirée par la **technologie**

   ❑ La technologie ciblée (à 10 ans) doit être disruptive

   ❑ A fort potentiel d'impact économique ou sociétal

   ❑ L'objet du projet est d'apporter la preuve de concept (à 3-4 ans)

❑ Dans cette perspective, la Commission européenne attend des projets :

   ▪ Interdisciplinaires

   ▪ Très risqués

   ▪ Explorant des approches et des directions novatrices

   ▪ Associant un consortium soutenant l'exploitation des résultats de recherche

Originalité des recherches

Analyse des risques

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FET Gatekeepers

❑ Les projets doivent répondre **à l'ensemble** des **3 « FET Gatekeepers »**

Scope: proposals are sought for cutting-edge **high-risk / high-impact interdisciplinary research with all of the following essential characteristics** ("FET gatekeepers"):

- **Radical vision:** the project must address a clear and radical vision, enabled by a new technology concept that challenges current paradigms. In particular, research to advance on the roadmap of a well-established technological paradigm, even if high-risk, will not be funded.

- **Breakthrough technological target:** the project must target a novel and ambitious science-to-technology breakthrough as a first proof of concept for its vision. In particular, blue-sky exploratory research without a clear technological objective will not be funded.

- **Ambitious interdisciplinary research** for achieving the technological breakthrough and that opens up new areas of investigation. In particular, projects with only low-risk incremental research, even if interdisciplinary, will not be funded.

Impacts Attendus

Expected Impact:

- Scientific and technological contributions to the foundation of a new future technology

- Potential for future social or economic impact or market creation.

- Building leading research and innovation capacity across Europe by involvement of key actors that can make a difference in the future. for example excellent young researchers. ambitious high-tech SMEs or first-time participants to FET under Horizon 2020[4].

Types de Partenaires

➡ En France les 3/4 des participants sont issus les **organismes de recherche et des universités**

➡ Au niveau EU, participation du **secteur privé** en augmentation entre 2014 et 2017, même si pas obligatoire

70 % des projets financés : au moins 1 SME

83 % des projets financés : au moins 1 SME et/ou industriel
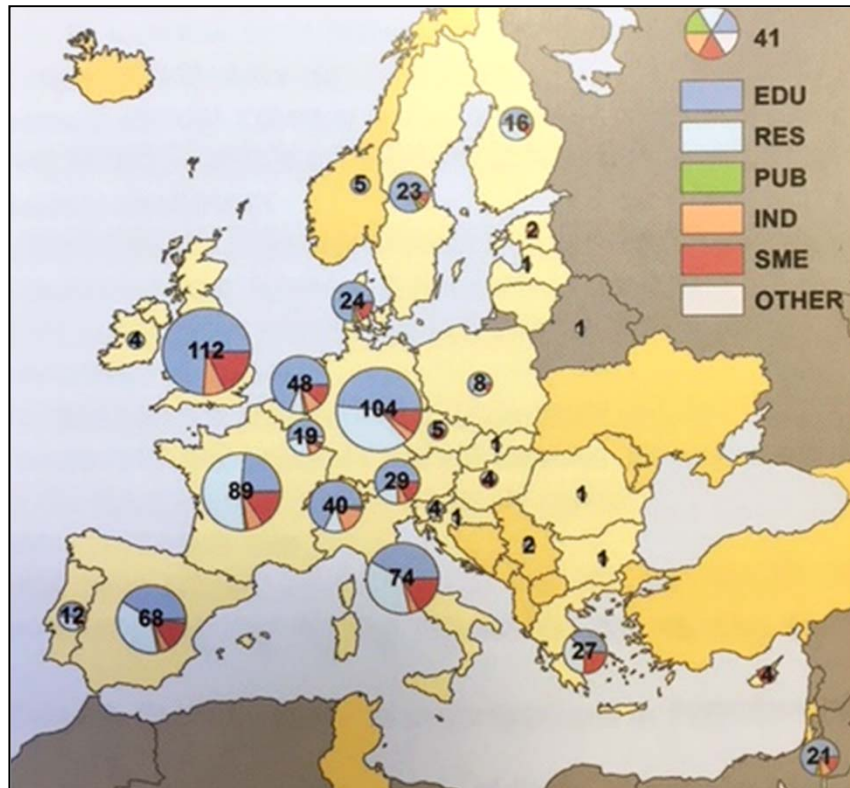
Nombre de participants dans les projets financés entre 2014 et 2017 par catégorie et par pays

Disciplines des Projets (Sélectionnés)

2014-2017

Mathematics, Computer sciences and information science
Physical sciences
Chemical sciences
Environmental sciences and engineering
Biological sciences and biotechnology
Civil, mechanical and aerospace engineering
Electrical and electronic engineering, robotics and automation
Materials engineering
Medicine and medical engineering
Humanities and Social sciences

■ 2014-2017

60%
40%
20%
0%

FET OPEN in 2014-2017: State of play
https://www.kowi.de/Portaldata/2/Resources/horizon2020/coop/FET-OPEN-2014-2017.pdf

Critères d'Evaluation

Excellence (4/5 – 60 %)	Impact (3,5/5 – 20 %)	Implementation (3/5 – 20%)
❑ **Clarity of the radical vision** of a science-enabled technology and its **differentiation** from current paradigms.	❑ The extent to which the outputs of the project would **contribute to the expected impacts** listed in the work programme under this topic.	❑ Coherence and effectiveness of the **research methodology and work plan** to achieve project objectives and impacts, including adequate allocation of resources to tasks and partners.
❑ **Novelty and ambition of the** proposed science-to-technology **breakthrough** that addresses this vision.	❑ Effectiveness of **measures and plans to disseminate and use the results** (including management of IPR) **and to communicate** about the project to different target audiences.	❑ Role and **complementarity of the participants** and extent to which the consortium as a whole brings together the necessary expertise.
❑ Range of and **added value from interdisciplinarity** for opening up new areas of research; non-incrementality of the research proposed.		
❑ **High-risk, plausibility and flexibility** of the research approach.		

Budgets 2014-2020 et Calendrier

Appels à venir

- ➤ Taux de succès (% par projets)

11%

- ➤ Budget des appels

77,0 · 38,5 · 38,5 · 84,0 · 84,0 · 84,0 · 123,7 · 160,4 · 160,4 · 203,0

- ➤ Nombre de projets lauréats

24 · 11 · 11 · 22 · 26 · 27 · 39
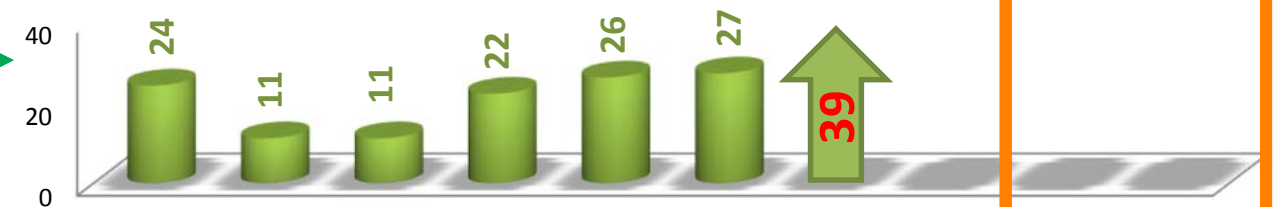
- ➤ Nombre de projets soumis

643 · 669 · 804 · 548 · 371 · 395 · 375 · 421
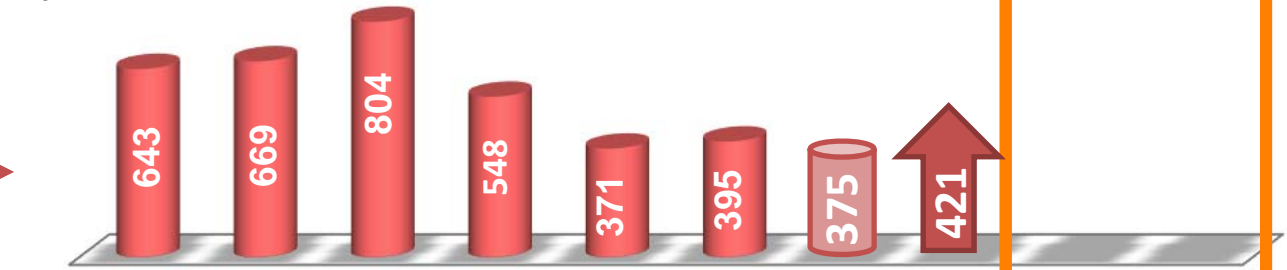
Dead line des appels · Sept. 2014 · Mars 2015 · Sept. 2015 · Mai 2016 · Janv. 2017 · Sept. 2017 · Mai 2018 · Janv. 2019 · 18 Sept. 2019 · 13 Mai 2020
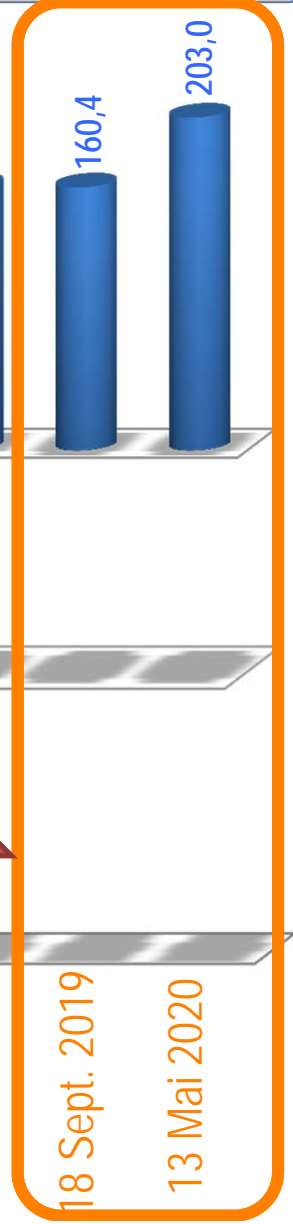
Innovation Launchpad

- ❑ 100 K€ par projet (CSA)

- ❑ 18 mois

- ❑ Explorer le potentiel d'innovation de résultats de recherches issus de projets FET (FET Open, FET Proactive, FET Flagships)

- ❑ Activités éligibles :
  - ▪ Définition d'un procédé de commercialisation
  - ▪ Analyse de compétitivité et de marché
  - ▪ Evaluation technologique
  - ▪ Vérification d'un potentiel d'innovation
  - ▪ Consolidation des droits de PI
  - ▪ Développement d'un plan de financement
  - ▪ Définition d'un procédé de commercialisation

- ❑ Taux de succès: 18% en 2017, 38% en 2018

- ❑ Environ 3 M€ par appel : **8/10/2019 et 14/10/2020**

"Turning results from FET-funded projects into innovations"

Focus on NON-scientific aspects

Eligibilité : projets en cours ou récemment finis (moins de un an à la date de soumission

Excellence (3/5 – 40 %)	Impact (3,5/5 – 40 %)	Implementation (3/5 – 20%)

A RETENIR

- **Budget en forte hausse**

- **Taux de succès attractif** (devrait atteindre 12% sur le dernier appel de janvier 2019)

- Prochaines dead lines

  - FET-open RIA
    - **18 September 2019** (160,65 M€)
    - **13 May 2020** (196,20 M€)

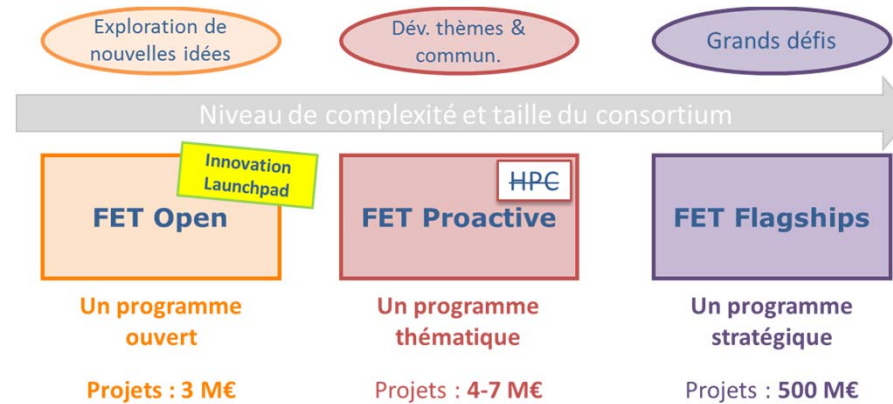 - Innovation Launchpad (CSA)
    - **8/10/2019**
    - **14/10/2020**
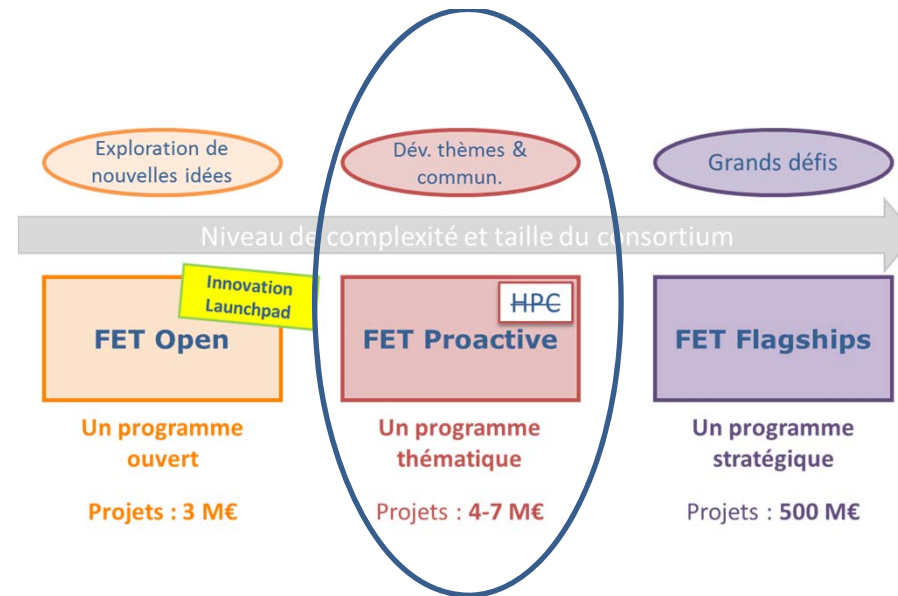
Les appels 2019-2020
FET Proactive
(dans EIC Pathfinder Pilot et programme FET)

FET PROACTIVE

- FET-Open = Novel ideas for radically new technologies

collaboration interdisciplinaire basée sur l'excellence scientifique visant à explorer des technologies radicalement nouvelles

- FET-Proactive= Boosting emerging technologies

vise à identifier et établir les paradigmes technologiques futurs et émergents présentant un fort potentiel pour l'économie et la société européenne.

FET- PROACTIVE
SYNTHESE DES APPELS 2019-2020

Deadline repoussée					Budget augmenté	

Sous-programme	Appel	Identifiant	Type	Deadline(s)	Budget par projet	Budget total
FET Proactive	**Emerging paradigms and communities**	[FETPROACT-EIC-5-2019](#)	RIA - Thématique	08/10/2019	4 M€	87,4 M€
FET Proactive	**EIC Transition to Innovation Activities**	[FETPROACT-EIC-6-2019](#)	RIA-Thématique	08/10/2019	1-2 M€	26 M€
FET Proactive	**Emerging paradigms and communities**	FETPROACT-EIC-7-2020	RIA-Thématique	22/04/2020	4-5 M€	50 M€
FET Proactive	**Environmental intelligence**	FETPROACT-EIC-8-2020	RIA-Thématique	22/04/2020	4 M€	18 M€
FET Proactive						M€

Attention : le détail de certains appels est dans le Work Programme FET-H2020, d'autres dans le Work Programme EIC
→ Thématiques 2019 dans le WP EIC – **en ligne**
→ Thématiques 2020 dans le WP FET – **draft en cours de validation**

FETPROACT-EIC-5-2019
« Emerging paradigms and communities »

❑ **RIA**, min 3 partners de 3 MS /AC

❑ Jusqu'à **4 M€ et jusqu'à 4 ans** (avec exceptions)

❑ Budget programme : **87,4 M€** (dont **35 à 52 M€ alloués à la thématique c**)

❑ **Thématiques** :

    a.   Human-Centric AI

    b.   Implantable autonomous devices and materials

    c.   Breakthrough zero-emissions energy generation for full decarbonization

Deadline 08/10/2019

Excellence (4/5 – 60 %)	Impact (3,5/5 – 20 %)	Implementation (3/5 – 20%)

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PCN FET – réunion Bordeaux – 13/06/2019

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FET Proactive : Technologies Emergentes

❑ Objectifs

- ▪ Le **soutien aux recherches interdisciplinaires** de rupture pour le développement de nouvelles technologies à partir de résultats scientifiques transversaux

- ▪ L'**établissement de communautés** interdisciplinaires larges de taille suffisante pour permettre l'avancement des sujets de recherche et leur traduction technologique

- ▪ La **mobilisation au-delà des communautés de recherche**, autour d'un nouveau paradigme technologique pour que l'Europe capitalise rapidement et efficacement

❑ Financement des projets : de 4 à 7 M€

❑ Un nouvel ensemble de domaines fera l'objet d'appels en 2019 et 2020

Excellence (4/5 – 60 %)	Impact (3,5/5 – 20 %)	Implementation (3/5 – 20%)

Impacts Attendus

❑ Scientific and technological contributions to the **foundation and consolidation of a radically new future technology**

❑ Potential for future **returns in terms of societal or economic innovation or market creation**

❑ **Spreading excellence and building leading innovation capacity** across Europe : involvement of key actors that can make a difference in the future (excellent young, researchers, ambitious high-tech SMEs or first-time participants)

❑ Build-up of a goal oriented **interdisciplinary community** (within and beyond the consortium)

❑ **Emergence of an innovation ecosystem** around a future technology in the theme addressed from outreach to and partnership with high potential actors in research and innovation, and from wider stakeholder/public engagement, with due consideration of aspects such as education, gender differences and long-term societal, ethical and legal implications

FETPROACT-EIC-5-2019
a. Human-Centric AI

Not only tech !
Opportunités pour les SHS

a. Human-Centric AI. Artificial intelligence (AI) is gaining more and more footholds in various aspects of our life. However, machine learning algorithms are difficult to understand, opaque and may have implicit biases in their decision making. Explicability has become an essential element if users are to trust, accept and adopt the next generation of intelligent machines on a wider scale. This initiative seeks to advance to the next AI frontier with verifiable, evidence-based features of trustworthiness (i.e., reliable and unbiased alignment of values, goals and beliefs) and transparency (explainable performance), exploring radically new approaches (e.g., inspired from neuro-science, cognition or social science). For instance, explanation could be more tightly intertwined with the decision making process itself so that decisions can be challenged, interpreted, refined and adjusted through mutual exchange, introspection (e.g., self-awareness of biases, reflecting on the internal functioning of the learning system, or on what caused a wrong or unacceptable decision) and active learning of both system and user, for example through dialogue or other forms of multi-modal interaction aimed at establishing mutual trust. New data collection and ownership/governance models that go beyond the dominant off-line and centralised data processing should be investigated, and new avenues, such as for incremental, unsupervised, active, one-shot and 'small data' machine learning, should be explored. The projects are expected to contribute to the wider debate on the sociotechnical, organisational and AIethical dimensions of such technologies and systems, and link to the 'Commission's broader AI strategy.

FETPROACT-EIC-5-2019
b. Implantable autonomous devices and materials

b. Implantable autonomous devices and materials. Radically new biomedical technologies that will lead to enhanced life quality for people are urgently needed, particularly for mitigating the impact of chronic health conditions that are placing a rapidly growing and ultimately unsustainable burden on healthcare systems. A key goal will be to demonstrate dramatically extended functional lifetimes of implantable devices, for example, through incorporation of smart sensing, self-awareness, adaptation (form and/or function) and selfrepair capabilities. Included are mobile micro/nano devices based on biological models that can perform advanced functions e.g. site specific automigration, ability to distinguish tissue types (diseased, normal) and perform highly localised actions (e.g., delivery of therapeutic agents). Entities incorporating (bio)materials that provide instances of totally autonomous biomimetic behaviour and in-situ integration and adaptation are particularly welcome, such as an ability to blend-in with the native biological environment, to independently generate power, synthesise active agents or sense and respond to changes in the local molecular environment. Work on ethical implications should be included.

FETPROACT-EIC-5-2019
c. Breakthrough zero-emissions energy generation for full decarbonization

Thématique fortement soutenue

c. Breakthrough zero-emissions energy generation for full decarbonization. Clean and sustainable energy is one of the major challenges of our time. This sub-topic aims at the multidisciplinary exploration of new directions (starting from TRL 1-3) for power generation that is clean, compact and low-cost, aimed at stand-alone, mobile or portable uses in specific application contexts, for instance, in the transport sector (road, air, sea and either for motive or auxiliary needs), for portable uses, in remote places or in emergency situations. Breakthrough concepts and techniques for energy generation have to be explored for generating heat and/or electricity efficiently with zero emissions and with a minimal use of rare or toxic materials. Research areas could include, for example, long duration high heat sources from hydrogen-metal systems (e.g., using nickel), energy generation in plasma and cavitation systems. These or any other concepts with similar compact, high energy density and low-cost energy generation capabilities should be harnessed to make them usable for specific application contexts. Clear and ambitious performance targets and milestones to achieve them shall be provided.

FET- PROACTIVE
SYNTHESE DES APPELS 2019-2020

**Deadline repoussée**

Budget augmenté

Sous-programme	Appel	Identifiant	Type	Deadline(s)	Budget par projet	Budget total
FET Proactive	**Emerging paradigms and communities**	FETPROACT-EIC-5-2019	RIA - Thématique	08/10/2019	4 M€	87,4 M€
FET Proactive	**EIC Transition to Innovation Activities**	FETPROACT-EIC-6-2019	RIA- Thématique	08/10/2019	1-2 M€	26 M€
FET Proactive	**Emerging paradigms and communities**	FETPROACT-EIC-7-2020	RIA- Thématique	22/04/2020	4-5 M€	50 M€
FET Proactive	**Environmental intelligence**	FETPROACT-EIC-8-2020	RIA- Thématique	22/04/2020	4 M€	18 M€
FET Proactive	*Neuromorphic Computing Technologies*	*FETPROACT-9-2020*	*RIA- Thématique*	*22/04/2020*	*4-5 M€*	*15 M€*

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FETPROACT-EIC-6-2019
« EIC Transition to Innovation Activities »

- ❑ **Gap** entre projets FET et autres financements

- ❑ Augmenter les possibilités de **transformer une recherche « FET » prometteuse en innovation disruptive**

- ❑ **Augmenter TRL** des résultats (terrain pour la maturation)
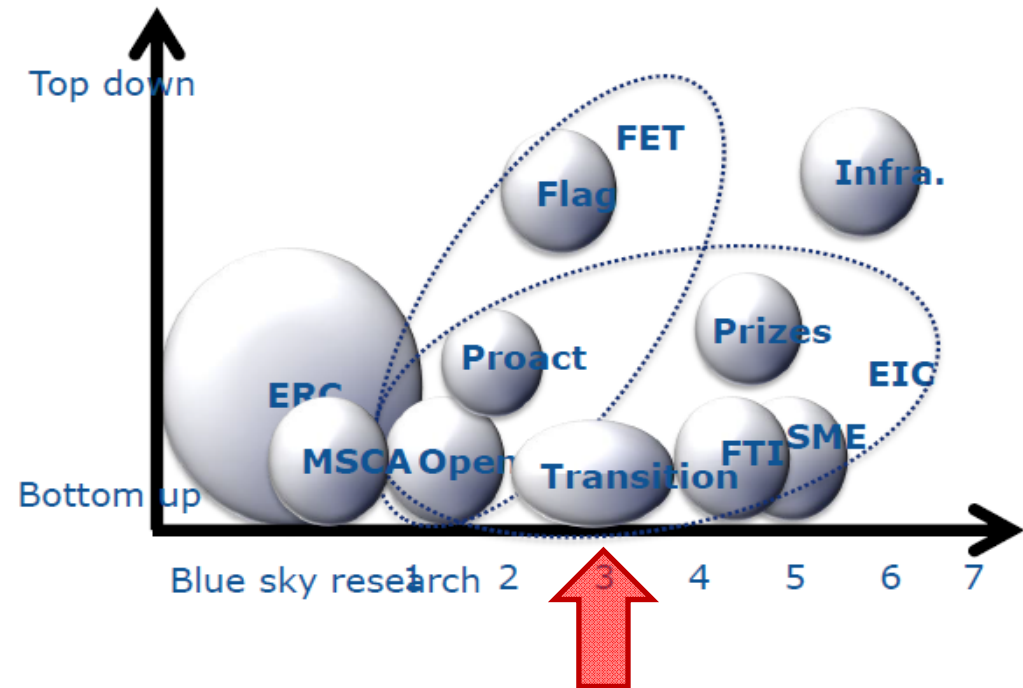
Les propositions doivent s'appuyer sur les résultats d'un projet financé par un programme FET (en cours ou terminé), clairement identifiées dans la proposition.

Attention aux **droits d'exploitation des résultats** : accord nécessaire dès la proposition si le porteur n'est pas propriétaire des résultats !

FETPROACT-EIC-6-2019
« EIC Transition to Innovation Activities »

Deadline 08/10/2019

❑ **RIA**, min 3 partners de 3 MS /AC

❑ **Entre 1 et 2 M€ et jusqu'à 2 ans** (avec exceptions)

❑ Budget programme : **26 M€** (dont **10 à 13 M€ alloués à la thématique d.**)

❑ **Thématiques** :

    a.   Micro- and Nano-technologies

    b.   Artificial Intelligence and advanced robotics

    c.   Technologies for the life sciences, health and treatment

    d.   Low-carbon energy and climate change technologies

    e.   Interaction technologies (including virtual-, augmented- and mixed reality, …)

Excellence (4/5 – 40 %)	Impact (4/5 – 40 %)	Implementation (3/5 – 20%)

FET- PROACTIVE
SYNTHESE DES APPELS 2020

Deadline repoussée

Budget augmenté

Sous-programme	Appel	Identifiant	Type	Deadline(s)	Budget par projet	Budget total
FET Proactive	**Emerging paradigms and communities**	FETPROACT-EIC-5-2019	RIA - Thématique	08/10/2019	4 M€	87,4 M€
FET Proactive	**EIC Transition to Innovation Activities**	FETPROACT-EIC-6-2019	RIA- Thématique	08/10/2019	1-2 M€	26 M€
FET Proactive	**Emerging paradigms and communities**	**FETPROACT-EIC-7-2020**	**RIA-Thématique**	**22/04/2020**	**4-5 M€**	**50 M€**
FET Proactive	**Environmental intelligence**	**FETPROACT-EIC-8-2020**	**RIA-Thématique**	**22/04/2020**	**4 M€**	**18 M€**
FET Proactive	*Neuromorphic Computing Technologies*	*FETPROACT-9-2020*	*RIA-Thématique*	*22/04/2020*	*4-5 M€*	*15 M€*

FETPROACT-EIC-7-2019
« Emerging paradigms and communities »

- ❑ **Deadline : 22/04/2020**

- ❑ RIA, min 3 partners de 3 MS /AC

- ❑ Jusqu'à **4 M€ et jusqu'à 4 ans**

- ❑ Budget programme : **50 M€**

- ❑ **Thématiques** :

  a. Future technologies for social experience

  b. Measuring the unmeasurable — Sub-nanoscale science for Nanometrology

  c. Digital twins for the life-sciences

a. Apport des avancées en VR, AR, XR aux réseaux sociaux futurs ; redéfinition de l'espace d'interaction personnelle et sociale ; couplage technologies / processus cognitifs-perceptifs

b. Techniques basées sur la physique, la chimie, la biochimie ; domaine spatial et temporel ; from research to methods; techniques existantes exclues

c. Intégration et interactions entre modélisation dynamique du digital twin et technologies d'imagerie ou de détection de sa contrepartie biologique

| Excellence (4/5 – 60 %) | Impact (3,5/5 – 20 %) | Implementation (3/5 – 20%) |

a-Future technologies for social experience

- **a. Future technologies for social experience.** This sub-topic explores new technologies for interaction that are based on new kinds of immersion for virtualised or augmented social interaction and that will lay the basis for the social media in 10-20 years from now. Virtual, Augmented and Mixed Reality (XR) will be as ubiquitous as Smart Phones are today. XR will serve as a starting point for new kinds of social media in which some of the participants may not be real people, where time differences are abolished, and where information and experiences will be shared in radically new ways. It is currently not known whether the sociocultural parameters implicit in natural social interaction carry over to virtual or hybrid settings or whether this leads to adaptations, new potential conflicts requiring recalibration of affective signals, cues carrying trust, empathy, conflict resolution. The sub-topic thus addresses the redefinition of the personal and social interaction space in light of increasing virtualisation, space-time displacement, information pressure, ubiquitous intelligence, uncertainty and trust issues (dis- and mis-information, anomaly detection in information sources and content, unwanted information, and similar concepts in the social realm, like opinion dynamics and social believe formation). Technologically this will be driven by a more active role of the interaction environment and an ever tighter coupling of the technologies with sensori/motor- and cognitive processes through advanced and multimodal XR setups, including for instance spatial audio, smart skins, haptics, wearable or other minimally invasive interfaces. Impacts on a 'person's self-perception and behaviour, gender differences, the formation of knowledge and believes, the theory of mind and brain and the ability to act and interact should also be studied, especially in scenarios of extensive and always-on use.

b-Measuring the unmeasurable — Sub-nanoscale science for Nanometrology

- **b. Measuring the unmeasurable — Sub-nanoscale science for Nanometrology**. This sub-topic seeks to find and test new approaches for nano- and sub-nano metrology. Proposals should target new techniques, for example, physics-, biochemistry- and chemistry-based methods incorporating nano- and picometre-length scales in the spatial domain with femto- and atto-seconds in the temporal domain. The proposal must address research from a novel measurement concept up to a technique and/or method including prototype measuring devices/setups and procedures, and sound metrological aspects like quantification of uncertainty or traceability. Proposals should seek to approach theoretical limits in challenging domains (physical, chemical, biological) while minimising any potential damage or change to the object being measured. Full three-dimensional characterisation (tomography) or the application of metrological procedures to transient phenomena on a sub-nanosecond time-scale could push the limits in metrology. Research on refining existing techniques is excluded. Proposals will address emerging issues of nano-metrology in spatial and temporal dimensions, including for example morphology, composition, reactivity, energy, dynamics or relevant optical, electronic, chemical and biochemical properties. Challenges in measurement that could be used as test cases are, e.g., understanding and controlling changing morphology impacting chemical properties in nano-photonic devices or battery electrodes; integrating metrology with sub-nanoprinting, nano-engineering or self-characterisation techniques; the measurements of heat transfer across interfaces down to the atomic size level; or the characterisation of the dynamics of molecular interactions in or with biological systems for health or smart materials. The use of advanced modelling, statistical methods, big data and machine learning methods is welcome where appropriate.

c-Digital twins for the life-sciences

- **c. Digital twins for the life-sciences.** The sub-topic aims at the close integration and real-time interaction of dynamical models of biological structures (from biochemical pathways to cells, tissues, organs and individuals), with imaging and sensing technologies for biological mechanisms and processes. It extends concepts and technologies of digital twins beyond their industrial versions, which are typically supporting the life-cycle of engineered products, into the domain of the life sciences. The core challenge is to derive and update the digital twin using information from the imaging, sensing and monitoring of its biological counterpart, taking the achievements of systems biology, metabolomics and systems medicine into account. This can be done in vivo at whole-body (e.g., using wearable and implantable sensors) or organ level or in vitro – e.g., for interacting cells and organoids, 3D cell co-cultures, organ/body-on-chip). Beyond the development of static and structural models, a further challenge is to include dynamics at multiple temporal scales (e.g. for deriving adaptive, predictive values), through new principles of imaging and sensing that take the time-dimension into account. Biological dynamics can be observed in the unmanipulated state or under manipulation by chemical, biological, physical agents such as pharmaceuticals, viruses, acoustic waves, electromagnetic fields, light, forces, or altered temperature. This will offer unprecedented insights into the molecular and cellular dynamics underlying human disorders such as metabolic, cardiovascular, neurological, oncological or rare pathologies, where personalised precision medicines and advanced diagnostic and therapeutic approaches but also prevention measures (lifestyle, nutrition, environmental factors) are needed to make healthcare more effective, more convenient, cheaper and uniquely tailored to each patient. Work on ethical implications should be included.

FETPROACT-EIC-8-2019
« Environmental Intelligence »

- **Deadline : 22/04/2020**

- RIA, min 3 partners de 3 MS /AC

- Jusqu'à **4 M€ et jusqu'à 4 ans**

- Budget programme : **18 M€**

- **Thématiques** :

  a. New techniques for creating and using dynamic models of environmental evolution

  b. Radically novel approaches to resilient, reliable and environmentally responsible in-situ monitoring.

Synergies entre communautés « lointaines » (modélisation environnementale, capteurs, sciences sociales, IA) pour aboutir à des approches radicalement nouvelles de création et d'utilisation de modèles dynamiques de l'environnement (surveillance, analyse et gestion des ressources critiques en Europe).

Impact
- Données et modèles fiables et modèles pour l'élaboration de politiques environnementales

- Réduction de l'empreinte environnementale des TIC

- Sensibilisation des citoyens à l'impacts environnemental

Selected projects under this topic will be expected to collaborate, jointly aiming at delivering a blueprint for a full-fledged system for environmental intelligence

| Excellence (4/5 – 60 %) | Impact (3,5/5 – 20 %) | Implementation (3/5 – 20%) |

a-New techniques for creating and using dynamic models of environmental evolution

- **a. new techniques for creating and using dynamic models of environmental evolution** that combine, analyse and interpret data provided by in-situ sensing technologies with satellite remote sensing/earth observation and other environmental data sources, including human behaviour and gender differences, and economics and social sciences. The focus is on a better understanding of the interplay dynamics of natural and societal systems, for example on how policies and economics modelling predict human behaviours' impact on the environment, how social norms interact with the environment evolution and exploitation, or how the decisions based on changes in the environment in turn affect the state of the natural environment and vice-versa.

b-Radically novel approaches to resilient, reliable and environmentally responsible in-situ monitoring.

- **b. radically novel approaches to resilient, reliable and environmentally responsible in-situ monitoring**. In-situ sensing technologies (physical, chemical, biological, behavioural) for environmental monitoring, in particular favouring sensors for parameters and environments that are currently under-sampled but at the same time critical for improving predictive models for understanding environmental processes. Proposals should look for ground-breaking concepts of affordable sensor deployment, spanning maintenance, communication and retrieval, possibly based on concepts like self-deployment, self-awareness, self-repair and controlled decomposition; or using new concepts from micro-robots to optimise sensing or increase monitoring frequency. Advanced research on the networking aspects is not addressing this sub-topic.

- Projects are to focus on one or a few critical resources (e.g., water, air) and to establish fundamental advances on the most critical challenges that will underpin a step improvement in monitoring, analysis and management of important social/environmental processes for improving quality of life and environmental sustainability (possibly including aspects of waste, noise, …). Citizen involvement, for example for prioritizing resource challenges, data collection, raising awareness towards environmental issues or better understanding of behavioural change in relation to environmental sustainability, is encouraged, in line with the discussion on Responsible Research and Innovation (RRI) in the introduction to this FET work programme. The collected and simulated data should adhere to the FAIR data principle and be compliant with European Standards.

FETPROACT-EIC-9-2019 « Neuromorphic Computing Technologies»

- ❑ **Deadline : 22/04/2020**

- ❑ RIA, min 3 partners de 3 MS /AC

- ❑ Jusqu'à **4 M€ et jusqu'à 4 ans**

- ❑ Budget programme : **15 M€**

- ❑ **Scope**: Proposals will target **new computational substrates and engines**, based on new materials and engineering principles for efficient and low-power neuromorphic computing; together with new theories, architectures and algorithms for neuromorphic computation (classification, control,…), learning (including unsupervised, incremental, single-shot and/or event-based) and adaptation/plasticity for and in such new neuromorphic hardware.
- • These should be brought together in systems or artefacts that demonstrate **clear advantages for replacing or complementing state-of-the-art conventional approaches** in challenging end-to-end scenarios of use (e.g., on-line edge computing, personalisation, embedded, robotic/agent control,…) in various fields of applications.

Excellence (4/5 – 60 %)	Impact (3,5/5 – 20 %)	Implementation (3/5 – 20%)

Future Battery Technologies
a large scale FET initiative on future battery technologies

FET WP 2020 – A large-scale research initiative on Future Battery Technologies

- Work Programme 2020: cross cutting activities (draft)

- All call topics are likely to open on July 9 , 2019

- Deadline January 16, 2020

- Indicative budget 47 M€

Positioning in the R&I landscape

| | TRL 1 | TRL 2 | TRL 3 | TRL 4 | TRL 5 | TRL 6 | TRL 7 | TRL 8 | TRL 9 |

Scope

Long-term research | Short-to-medium term research | Industrialization

Actors

Driven by European research community

EERA · ALISTORE · EGVI · EMIRI · EUROBAT · RECHARGE · earpa · CLEPA · eucar · EASE · eit European Institute of Innovation & Technology · . . .

European Battery Alliance

Roadmap

To be developed in 2019 from the Manifesto | SET-Plan | Industrial roadmaps

BATTERY 2030+

BATTERIES EUROPE

EUROPEAN BATTERY ALLIANCE | EBA250

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FET WP 2020 – A large-scale research initiative on Future Battery Technologies

❑ **Battery 2030+ Initiative** (At the heart of the connected green society)

❑ Coordinateur : **Suède** (Uppsala University, K. Edström)
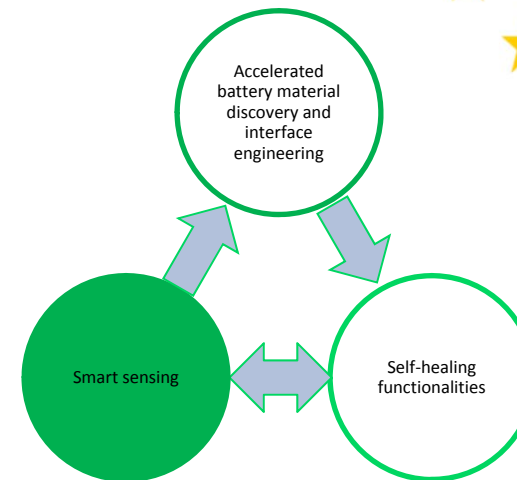
❑ Objectifs de la Commission :

  ▪ Long terme : 10ans

  ▪ Court et moyen termes : European Battery Alliance

❑ **Premiers appels en 2020**

❑ Thèmes de recherche du Flagship

  ▪ Material acceleration platform

  ▪ Battery interface engineering

  ▪ Smart battery functionalities

  ▪ Producibility/manufacturability

  ▪ Recyclability

❑ Représentation actuelle de la France : CNRS et CEA (pour 15 partenaires)

Les partenaires européens potentiels sont estimés à 70 !

Accelerated battery material discovery and interface engineering

Smart sensing

Self-healing functionalities

http://battery2030project.eu

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FET WP 2020 – A large-scale research initiative on Future Battery Technologies

- **Kick start a large scale research initiative on future battery technologies**
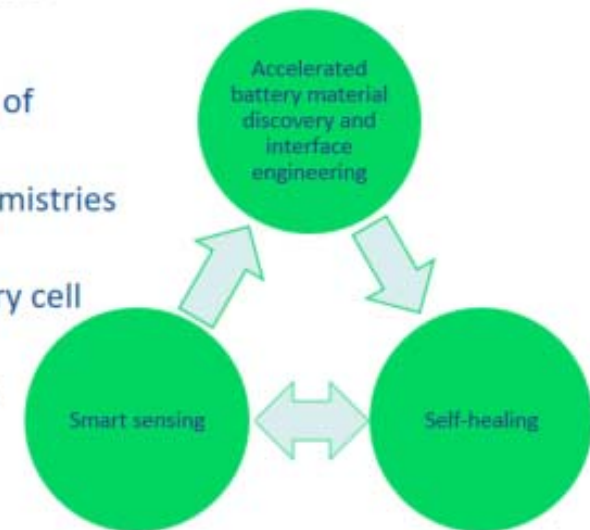 - LC-BAT-12-2020 Novel methodologies for autonomous discovery of advanced battery chemistries – 20M€, R&I
  - LC-BAT-13-2020 Sensing functionalities for smart battery cell chemistries – 10M€ , R&I
  - LC-BAT-14-2020 Self-healing functionalities for long lasting battery cell chemistries – 10M€ , R&I
  - LC-BAT-15-2020 Coordinate and support the large scale research initiative on future battery technologies – 2 M€, CSA

  42M€, ddl 16th of January 2020

- **Kick start Member States joint support (ERANET)**
  - CE-NMBP-41-2020: Call for continuation of M-ERA.NET – 15M€
  - A joint call in 2020 with 5M€ EU top-up earmarked for battery activities

  5M€ for battery, ddl 13th of February 2020

Accelerated battery material discovery and interface engineering

Smart sensing

Self-healing

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LC-BAT-12-2020 Novel methodologies for autonomous discovery of advanced battery chemistries

❑ Themes

- Integration of advanced multi-scale computational modelling, materials synthesis, characterization and testing to perform closed-loop autonomous materials findings

- **Develop a pilot material discovery platform** and demonstrate key features, paving the way towards the development of a full-scale autonomous battery Material Acceleration Platform (MAP)

- Demonstrate a fundamental paradigm shift in the materials discovery process for clean energy materials

❑ Action (RIA) of a 3 years duration, estimated EU contribution 20M€

❑ Total budget = 20M€
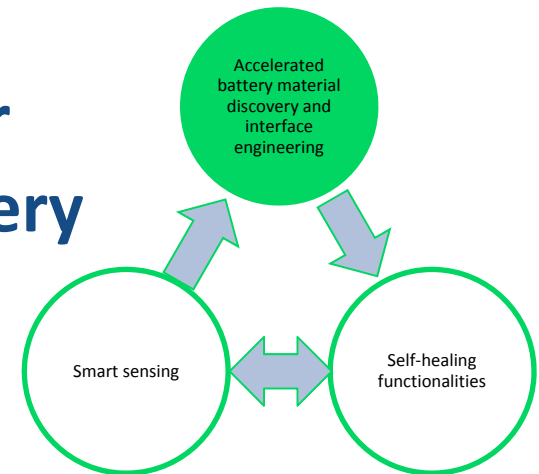
LC-BAT-13-2020 Sensing functionalities for smart battery cell chemistries
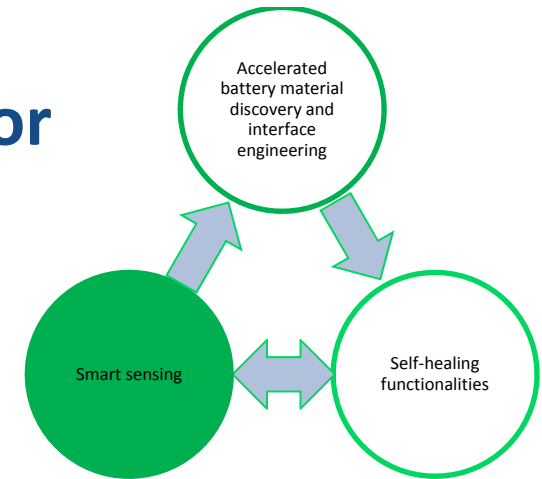
❑ Themes

- Incorporate smart functionalities into the battery cell for following relevant component parameters

- **Develop a proof of concept for the establishment of successful sensing technologies capable o monitoring changes within a battery cell under various operation conditions**

- Increased quality, reliability and life of the battery system

❑ Actions (RIA) of a 3 years duration, estimated EU contribution 2 to 4M€

❑ Budget = 10M€

LC-BAT-14-2020 Self healing functionalities for long lasting battery cell chemistries

❑ Themes

- Sensing can help identify defective components and local spots in the cell that need to be repaired by injection or addition of self-healing functions

- **Deliver proof-of-concept battery cells with self healing functionalities showing how this is achived using advanced analytical tools**

- Increased quality, reliability and life of the battery system by extending the lifetime of the battery cells and maximizing their performance

❑ Actions (RIA) of a 3 years duration, estimated EU contribution 2 to 4M€
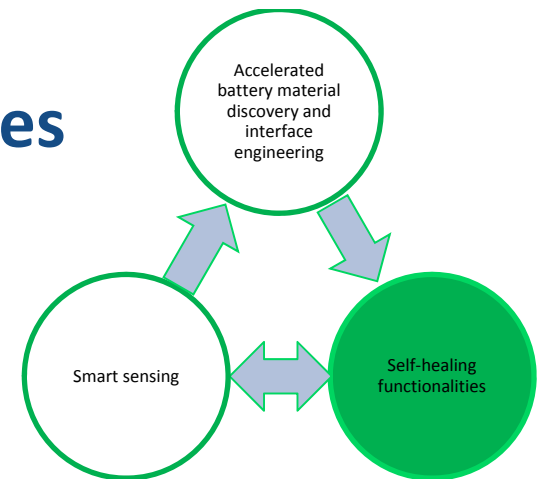
❑ Budget = 10M€

LC-BAT-15-2020 Coordinate and support the large scale research initiative on future battery technologies

❑ Themes

- Network the large scale research initiative on Future Battery Technologies

- Facilitate communication, dialogue and cooperation

- Pave the way to industrial exploitation of future battery technologies in key energy or transport applications

- **All actions funded under BATFLAG call topics will be required to contribute to CSA activities**

❑ CSA of a 3 years duration, estimated EU contribution to 2M€

❑ Budget = 2M€
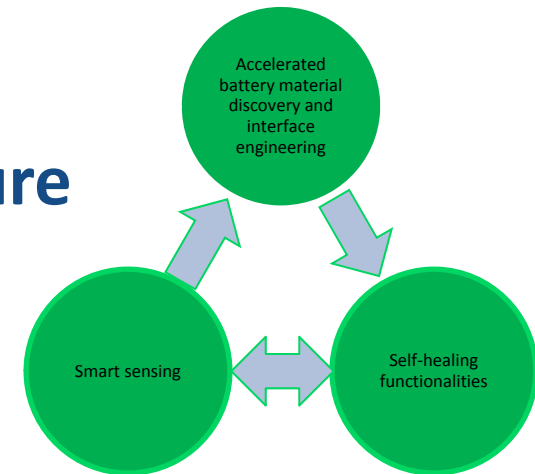
Appel ANR dédié au montage de réseaux scientifiques européens et internationaux: MRSEI

→ **Taux de succès à 40%**
→ **20% des projets financés obtiennent un financement EU**

CONDITIONS ET OBJECTIFS

Des financement d'aide au Montage de Réseau Scientifique Européen ou International à destination **des coordinateurs de projets européens**, appartenant aux organismes publics de recherche en France; pilotant un consortium européen de haut niveau, **issus de toutes les disciplines.**

Objectifs :
- Faciliter l'accès des chercheurs français aux programmes de financement européens (H2020)
- Renforcer le positionnement de la France à l'International par la coordination Française des projets scientifiques de grande ampleur
- Dynamiser et accompagner les chercheurs dans le montage de leurs projets Européens ou Internationaux

Caractéristiques : 30 k€ pour une durée de 24 mois
→ Pour financer les réunions des partenaires et des ateliers du consortium, nécessaires à la définition du projet européen et à celle de la meilleure stratégie de recherche.

Appel en continu avec deux dates d'évaluation :
21 mars 2019 et 17 septembre 2019

Plus d'informations

Infoday EIC Pathfinder du 02/04/2019 (présentations et videos) :
https://ec.europa.eu/digital-single-market/en/news/european-innovation-council-pathfinder-and-future-and-emerging-technologies-info-day-brussels

Webinaire FET Proactive organisé par le PCN FET le 24/06/2019 :
http://www.horizon2020.gouv.fr/cid140362/save-the-date-webinaire-fet-proactive.html

Boîte à outils pour les candidats :
http://www.horizon2020.gouv.fr/cid130111/boite-outils-pour-les-projets-technologies-futures-emergentes-fet.html