

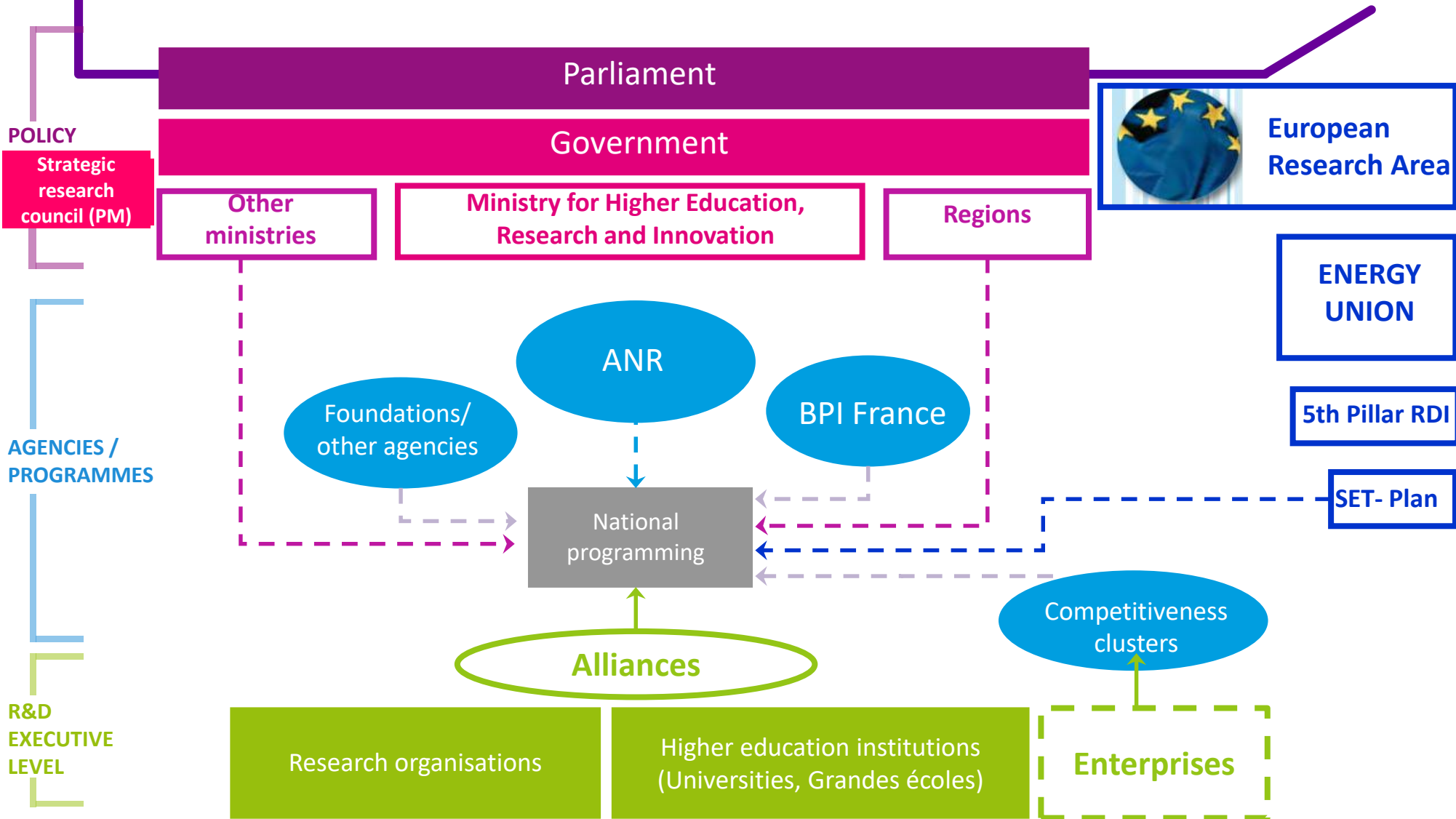
« EUROPEAN UNIVERSITIES FOR A CLEAN ENERGY FUTURE » CLUSTERING EVENT

The French landscape

Strategy Service (SSRI), DG Research and Innovation
French Ministry of Higher Education, Research, and Innovation

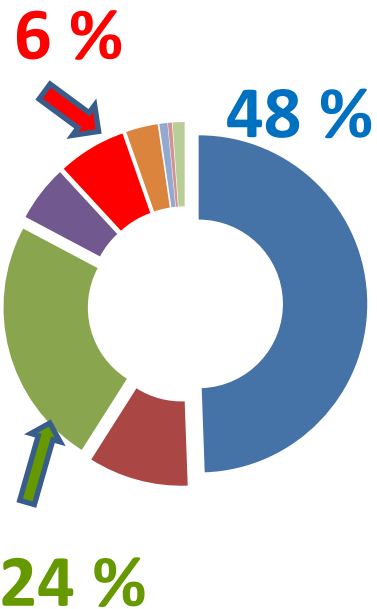
Dr Frederic RAVEL

THE FRENCH RESEARCH AND INNOVATION SYSTEM



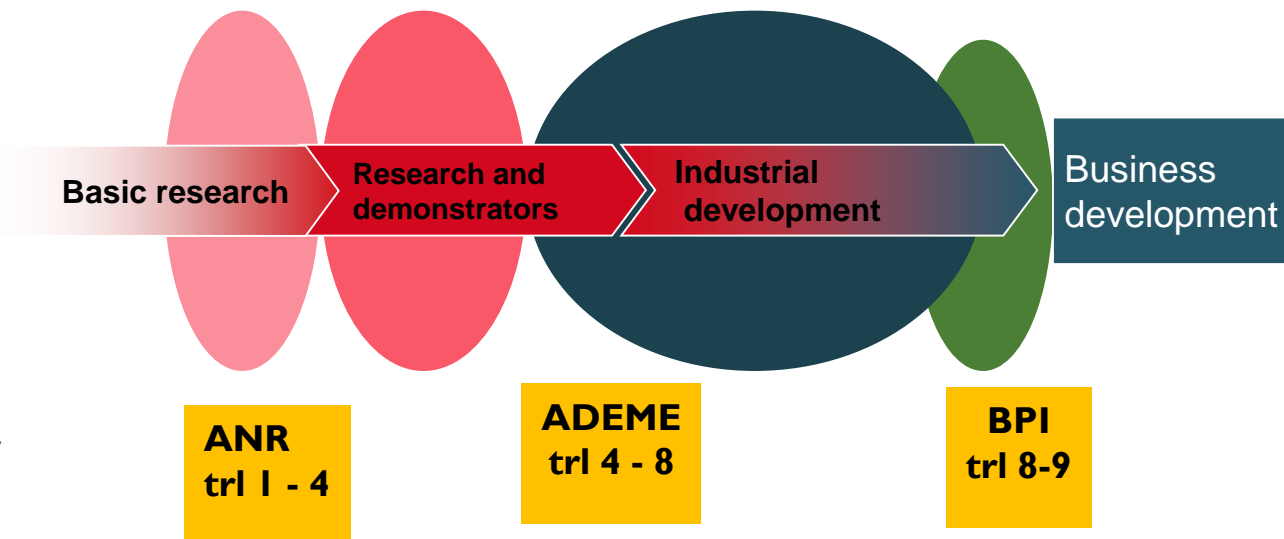
Programs of the interdepartmental Mission for Research and Higher Education (MIREs)

MIREs PLF 2018	Program	Lead ministry	Funding (Meuros)	Destination
Training and research in universities	150	Higher education and research	13 435 M€	Universities
Student life	231	Higher education and research	2 698 M€	Universities
Scientific and technologic multi -disciplinary research	172	Higher education and research	6 766 M€	ANR (736M€) , CNRS, INSERM, INRIA, CEA, BRGM, IRSTEA, IFREMER, INRA...
Research for Space	193	Higher education and research	1 618 M€	CNES
Research in energy, sustainable development and mobility	190	energy	1 611 M€	ADEME, IFPEN, IFSTTAR, CEA, CSTB, IRSN
Higher education and research for industry	192	industry	778 M€	Mines Telecoms
Recherche duale (civile et militaire)	191	defense	179 M€	CNES CEA
Research for culture	186	culture	111 M€	
Higher education and research for agriculture	142	agriculture	345 M€	
Total research & higher education			27 668 M€	



PUBLIC SUPPORT FOR RDI ON LOW CARBON TECHNOLOGIES

- Public research organisms support basic or industrial research conducted by their researchers (~440 M€ /year)
 - ✓ CNRS, CEA, IFPEN, ...
- Public funding agencies driving RDI programs on energy technologies through call for projects:
 - ✓ ANR (research generalist)
 - ✓ ADEME (energy & environment),
 - ✓ BPI (generalist innovation)
- The “programme investissements d’avenir (PIA)”, an important financial effort for low carbon innovation
 - ✓ More than 3 bn€ on clean energy from 2010 to 2018
 - ✓ in the form of subsidies, refundable grants, equity and loans

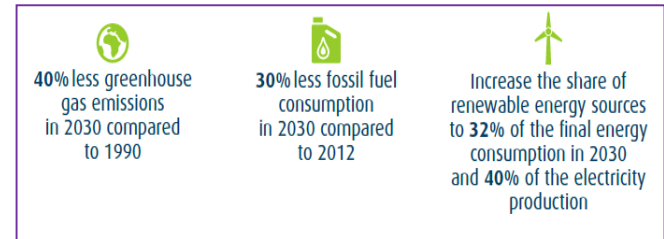


2015-2017

BUILDING A NATIONAL ENERGY RESEARCH STRATEGY

▪ The “secure, clean and efficient energy” challenge of the national research strategy (2015)

- Dynamic management of energy systems
- Multi-scale governance of new energy systems
- Energy efficiency
- Reduced need for strategic materials
- Non fossil chemistry sectors



▪ The *Energy Transition for Green Growth act (2015)* : clear and ambitious goals

▪ Some orientations for National energy research strategy (dec 2016)

- Adopt a systemic approach and focus on transversal issues related to energy (impact on environment, social and economic issues, digital revolution)
- Consolidate a basic energy research community
- Foster public-private collaboration, through industrial research and demonstration
- Articulate the RDI policies at different geographic levels (local, national, European and international)

▪ “Plan Climat” launched in July 2017 by Pdt. Macron : “Achieve carbon neutrality by 2050”

- axis 12 : Design future solutions together with research: bolster schemes aimed at scientific cooperation and at enhancing appeal in the key disciplines for combating climate change



THE NATIONAL ENERGY RESEARCH STRATEGY

- Strategic direction 1: target key transformational themes for energy transition
- Strategic direction 2: develop RDI in relation to territories and the industrial network, in particular SME
- **Strategic direction 3: develop skills and knowledge for and through R&D&I**
 - **Training and information of different interested publics**
 - Civil society
 - Decision-makers
 - Professionnals

EXTRACTS FROM THE NATIONAL RESEARCH ENERGY STRATEGY

- **“to increase the interdisciplinary nature of the programs** (especially in the Master's level courses in the energy field) in order to allow a deep understanding of the transformations induced by the energy transition, **including training in the humanities and social sciences;** and thus **be able to provide a systemic vision** for optimal integration of technologies and integrating the human and the environment into the system;
- **to adapt training programs to specific disciplinary fields** (power electronics, materials in extreme conditions, telecommunication networks, system engineering, etc.) and **to create new training courses** (eg adaptation to new types of markets induced by the increased penetration of renewable energies, standardization, intellectual property awareness);”

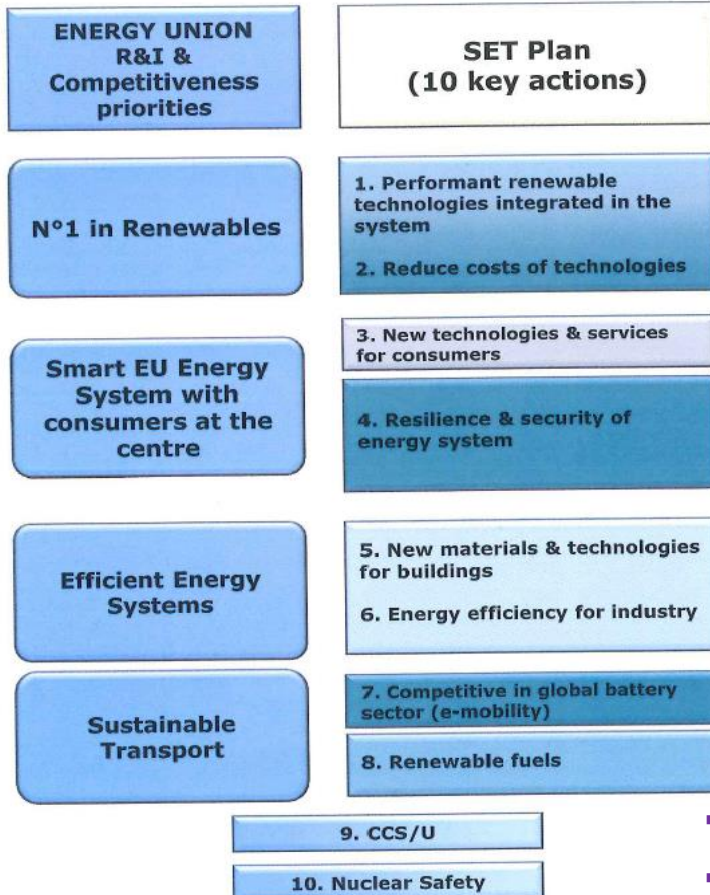
EXTRACTS FROM THE NATIONAL RESEARCH ENERGY STRATEGY

- *“to integrate training programs into a dynamic vision with the ability to adapt to new skills needs; Thus, in view of the time required for training, the needs assessment should be conducted now, in particular by drawing on European initiatives in this area (eg UNI-SET program coordinated by the European University Association - EUA - in association with KIC Inno-energy). This work must involve companies that will ultimately be led to integrate the implications in terms of vocational training, apprenticeship and internships (workers, technicians, engineers).”*
- *“to increase the interaction between students and society (diffusion role of scientific and technical information (see below), participation in training courses territorial demonstration experiments);”*

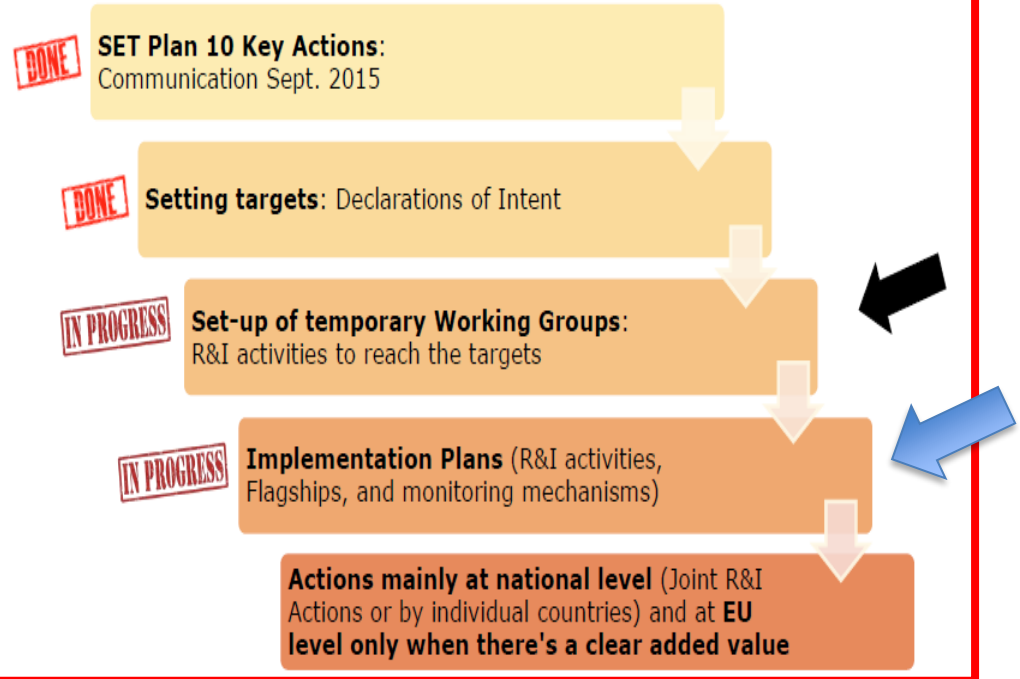
THE ENERGY UNION AND THE SET PLAN : 10 KEY ACTIONS ON ENERGY

COM Union de l'Énergie (Feb 2015)

COM SET-Plan (Sept 2015)



Main SET Plan steps



- Existence of targets, built and endorsed in common by MS.
- Existence of current working groups gathering MS.

MISSION INNOVATION : CLEAN ENERGY R&D FOCUS AREA

Increased public sector support for clean energy R&D, in line with national commitments to seek to double governmental and/or state-directed investment in clean energy R&D over five years

The 7 Innovation Challenges:

- High Priority Areas of Mutual Interest
- Opportunities for Collaboration Between Mission Innovation Members
- Encourage Increased Engagement by Global Research Community, Industry, and Investors
- Outcomes May Inform, Guide and Support MI Country Investments in R&D

Country	Baseline Amount Declared in June 2016, unless otherwise noted	
	(million currency as declared, per year)	(million USD per year ¹)
France	440 EUR	494

	Australia	Brazil	Canada	Chile	China	Denmark	EC	Finland	France	Germany	India	Indonesia	Italy	Japan	Mexico	Norway	Republic of Korea	Saudi Arabia	Sweden	The Netherlands	UAE	UK	USA
1 Smart Grids Innovation Challenge	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant
2 Off Grid Access to Electricity Innovation Challenge	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant
3 Carbon Capture Innovation Challenge	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant
4 Sustainable Biofuels Innovation Challenge	Participant	Lead	Lead	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant
5 Converting Sunlight Innovation Challenge	Participant	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant
6 Clean Energy Materials Innovation Challenge	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant
7 Affordable Heating and Cooling of Buildings Innovation Challenge	Participant	Participant	Participant	Participant	Participant	Lead	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Participant	Lead	Lead	Participant

 Lead
 Participant

CURRENT ENERGY TOPICS

■ Renewable Energy production

- Diversification of the electric mix : PV, wind, geothermal....
- Renewable heating and cooling.
- Combined heat and power generation.
- Production of fuels, heat, electricity from biomass and biotechnologies.
- Raw materials challenge.

■ Energy systems

- Security and stability of energy supply with an increasing rate of variable electricity production ,and a shift towards more electric use.
- Data collection, management and safety.
- Synergies between different networks (electricity, heat, natural gas, hydrogen).
- New schemes for local grids with more small scale producers, prosumers.

■ Energy storage : a key-role for the grid

- Focus on batteries
- Focus on hydrogen

■ Energy efficiency, ressources and waste

- Processes, low energy consumption
- Materials for energy , buildings
- Use of CO₂

■ Future of the SET Plan

- Involvement in the working groups
- Current and future implementation plans

SCIENTIFIC TOPICS IN NATIONAL RESEARCH AGENCY PROGRAM

■ National research agency (ANR) call

■ **Axis : « sustainable, clean, secure and efficient energy »**

- 1.1 : *Fundamental research , breakthrough concepts*
- 1.2 : *Renewable sources , energy harvesting from the environment (solar, ocean, wind...)*
- 1.3 : *Uses of the subsoil in an energetic perspective (geothermal , storage)*
- 1.4 : *Conversion of energy into biofuels, applications deriving from biosourced chemistry, CO₂ use*
- 1.5 : *Dynamic management of energy systems : storage, networks, vectors (batteries, hydrogen,*
- 1.6 : *Energy efficient processes , CO₂ Capture and Sequestration*
- 1.7 : *Economic and sociologic issues of the energy transition*

■ **Axis : « Bioeconomie : technologies (chemistry, biotechs, processes) and systemic approaches »**

Cross-cutting issue between axis energy, agriculture and food , industrial innovative processes

2018 : A FIRST CALL FOR PROPOSALS BETWEEN MESRI(ANR)-BMBF

ANR and BMBF are currently discussing to launch, at the end of 2017, an ambitious call for proposals on sustainable energy.

Topics (based on a position paper prepared for the 5th Franco-German Forum) :

Conversion and storage of energy from renewable sources

- Electrical and electrochemical storage materials and technology, especially new batteries
- Storage systems for use within smart grids (p. ex. ancillary services, virtual power plants)
- Power-to-X technologies including electrolysis, synthetic fuel production, photoelectrochemistry and solar fuels
- Hydrogen and fuel cell technologies, hydrogen storage and distribution

Smart Grids at transmission and distribution levels

- Materials and technologies for smart grids in general and for high-voltage direct current transmission systems
- Grid flexibilization and management (including architectures, digitalization, storage integration, other flexibilization technologies)
- Border-crossing aspects on the technical and governance levels (p.ex. interoperability, regulations, European energy market)

Non technological aspects of the energy transition (involving social sciences and humanities)

Partnerships and TRL levels expected:

- **Minimum consortium: at least 4 partners**
 - one German academic partner and one French academic partner
 - one German company and one French company
- **TRL levels: between 1 and 5 , application-oriented basic research**