



THE EU FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

HORIZON 2020

H2020 - Energy Calls 2016-2017



Dr. Vassilios KOUGIONAS
DG Research & Innovation,
Unit G2 – Advanced Energy Production

European Commission



Content overview

- Context
- Relevant Calls 2016-2017
 - Energy Efficiency (EE)
 - Competitive Low-Carbon Energy (LCE)
 - Smart and Sustainable Cities – Smart Cities and Communities (SCC)
 - SME instrument
 - Fast track to Innovation
- Cross-cutting issues
- Rules for Participation
- Support



Horizon 2020 – Overall Objectives

HORIZON 2020

Responding to the economic crisis by investing in future jobs and growth

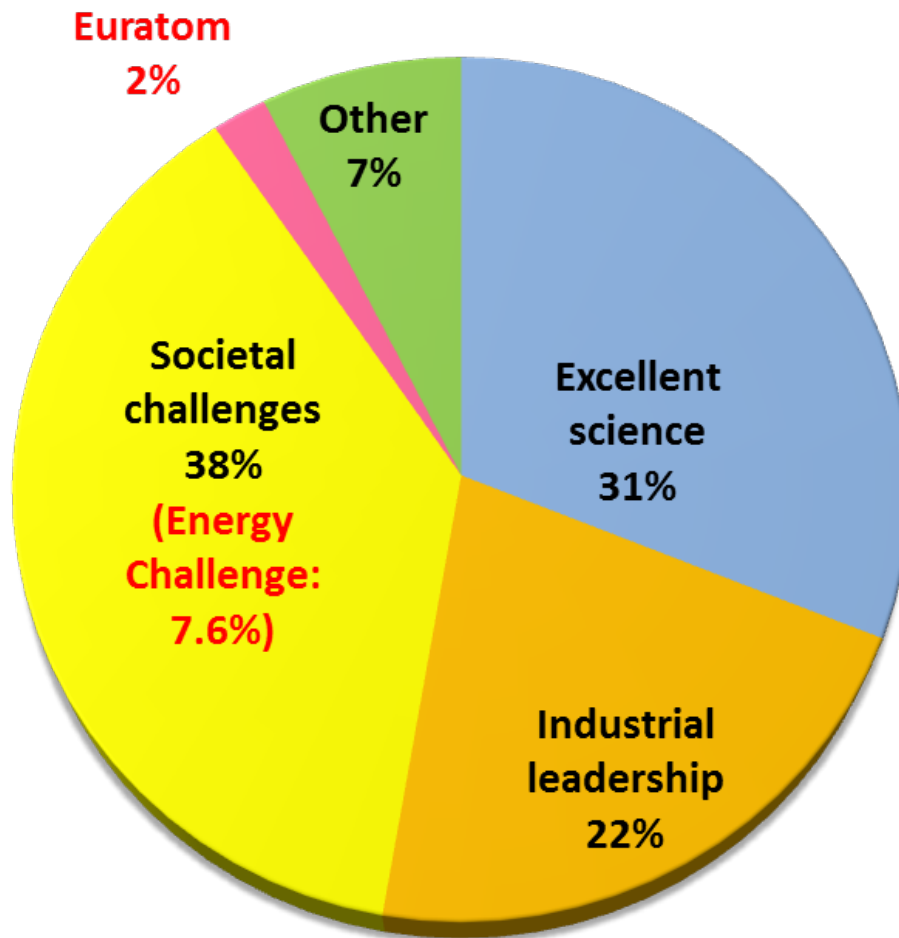
Strengthening the EU's global position in research, innovation and technology

Addressing people's concerns about their livelihoods, safety and environment

Contributing to sustainable development (at least 35% of the overall budget)

Supporting EU policies (e.g. Europe 2020 / Energy Union)

Horizon 2020 – Overall budgets



Total budget H2020:
EUR 74,83 billion

Budget of the
Energy Challenge:
EUR 5,69 billion

The 2016-2017 calls of the Energy Challenge

Energy Efficiency (EE)

- Heating and Cooling
- Engaging consumers
- Buildings
- Industry, services and Products
- Innovative financing

Competitive low-carbon energy Technologies (LCE)

- Energy system (grids, storage)
- Renewable energies
- Decarbonising fossil fuels
- Socio-economic research
- European Research Area in energy

Smart Cities and Communities (SCC)

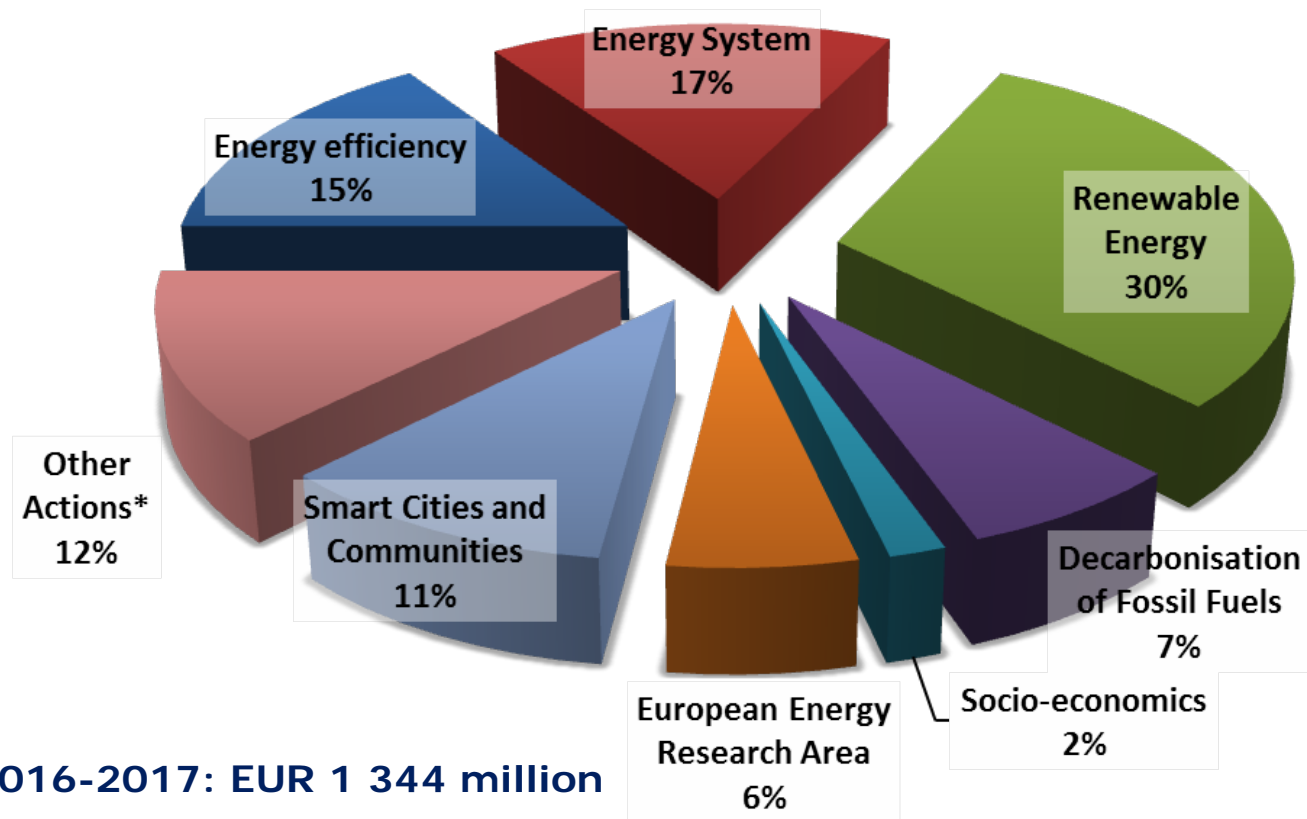
- Light-house demonstration projects

SME instrument (SIE)

Call budgets (in Mio €)

Call	2016	2017
EE	93	101
LCE	352,66	367,62
SCC	60	71,50
SME	46	50

Indicative budget distribution per area for Energy calls 2016-2017



Total budget 2016-2017: EUR 1 344 million

* **Other Actions** = actions not implemented through calls for proposals (e.g. Risk Finance, procurements, subscriptions, contributions, grant to identified beneficiaries)

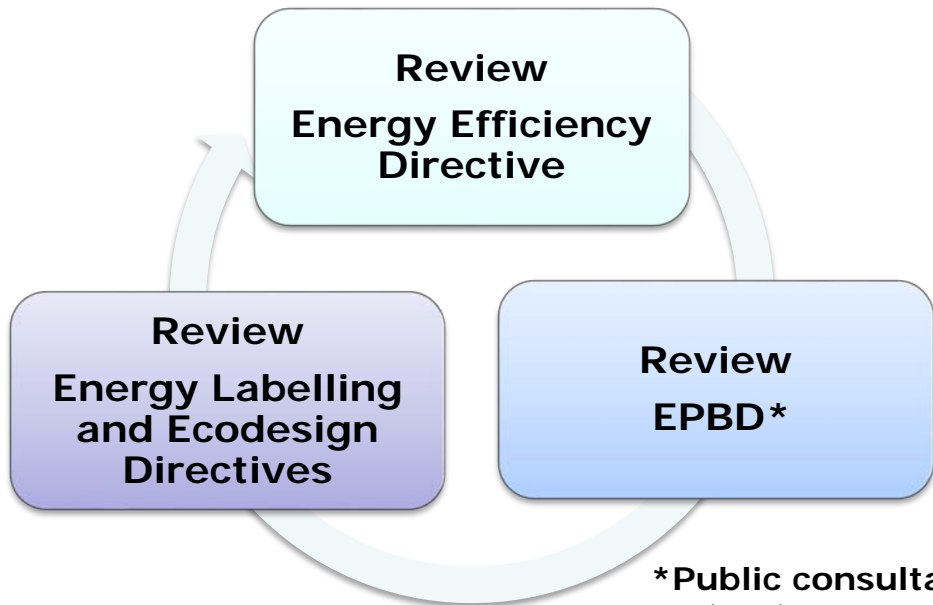


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Policy context

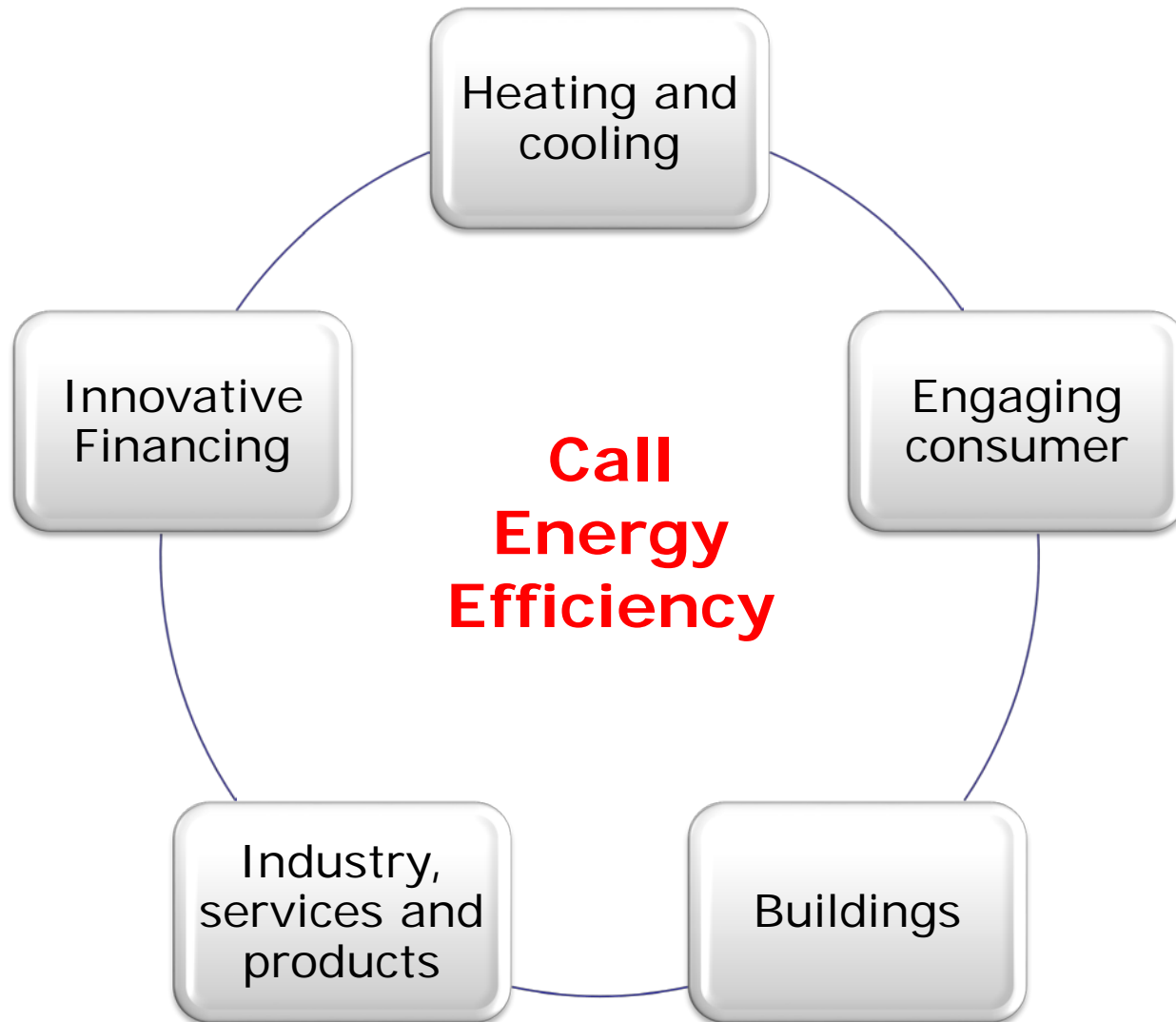
- 2020 & 2030 Framework for Climate and Energy
- Energy Union and its third pillar – Energy Efficiency



*Public consultation until
31/10/2015

WP 2016-2017:

- Focussing on consumer-related issues
- More topics on heating and cooling
- Multi-level approach to eliminate market barriers to finance for energy efficiency





Heating & Cooling – Topics 2016-2017

Innovation in **waste heat recovery** and **reuse technologies** (in cities and industry)

- *Topics EE-1-2017, EE-17-2016-2017, EE-20-2017*

District heating networks: innovation in urban waste heat reuse in DH, replication of efficient retrofitting of DH networks

- *Topics EE-1-2017, EE-2-2017*

Research and innovation of **efficient and low-carbon H&C technologies**

- *Topic EE-3-2016, EE-4-2016-2017*



Consumer engagement – Topics 2016-2017

Engaging private consumers towards sustainable energy

- *Topic EE-6-2016-2017*

Behavioural change toward energy-efficiency through ICT

- *Topic EE-7-2016-2017*

Socio-economic research on consumer's behaviour related to energy efficiency

- *Topic EE-8-2016*

Engaging and activating public authorities

- *Topic EE-9-2016-2017*

- **Consumer empowerment** through smart homes system and demand response EE-12-2017
- **Consumer information** through EU product efficiency legislation EE-16-2016-2017



Buildings – Topics 2016-2017

Deep renovation of buildings

- *Topics EE-10-2016 (EeB-PPP), EE-11-2016-2017*

Demand response in energy management systems

- *Topic EE-12-2017 (EeB-PPP)*

Cost reduction of new Nearly Zero-Energy buildings

- *Topic EE-13-2016*

Construction skills

- *Topic EE-14-2016-2017*



Industry, services and products – Topics 2016-2017

Capacity building in industry and energy services for industrial parks

- *Topic EE-15-2017, EE-18-2017*

Waste heat recovery / Energy symbiosis in industrial systems

- *Topic EE-17-2016-2017 (SPIRE-PPP)*

Joint energy-efficiency R&I efforts in industry & services (ERA-NET Cofund)

- *EE-21-2016*

Effective implementation of EU product legislation

- *Topic EE-16-2016-2017*

Energy efficient and integrated data centres

- *Topic EE-20-2017*

Public procurement of innovative energy efficiency solutions

- *Topic EE-19-2017*

Financing Energy Efficiency – Topics 2016-2017

Aggregation - Project development assistance

- *Topic EE-22-2016-2017*



De-risking - Standardisation and benchmarking

- *Topic EE-24-2016*

Market based culture - Energy efficiency services and innovative financing schemes

- *Topic EE-25-2016, EE-23-2017*

Energy Efficiency call 2016 - Overview

Deadline 21 January 2016

- Sub-budget: EUR 16 million
 - EE-10
 - EE-17
- Sub-budget: EUR 34 million
 - EE-3
 - EE-4
 - EE-5
 - EE-7
 - EE-8

IA – green
RIA – blue
CSA- orange
ERA-NET - black

Deadline 15 September 2016

- Sub-budget: EUR 30 million
 - EE-6
 - EE-9
 - EE-11
 - EE-13
 - EE-14
 - EE-16
 - EE-24
 - EE-25
- Sub-budget: EUR 8 million
 - EE-22
- Sub-budget: EUR 5 million
 - EE-21

Energy Efficiency call 2017 - Overview

Deadline 19 January 2017

- Sub-budget: EUR 16 million
 - EE-12
 - EE-17
- Sub-budget: EUR 30 million
 - EE-1
 - EE-4
 - EE-7
 - EE-20

IA – green
RIA – blue
CSA- orange
ERA-NET – black
PPI - purple

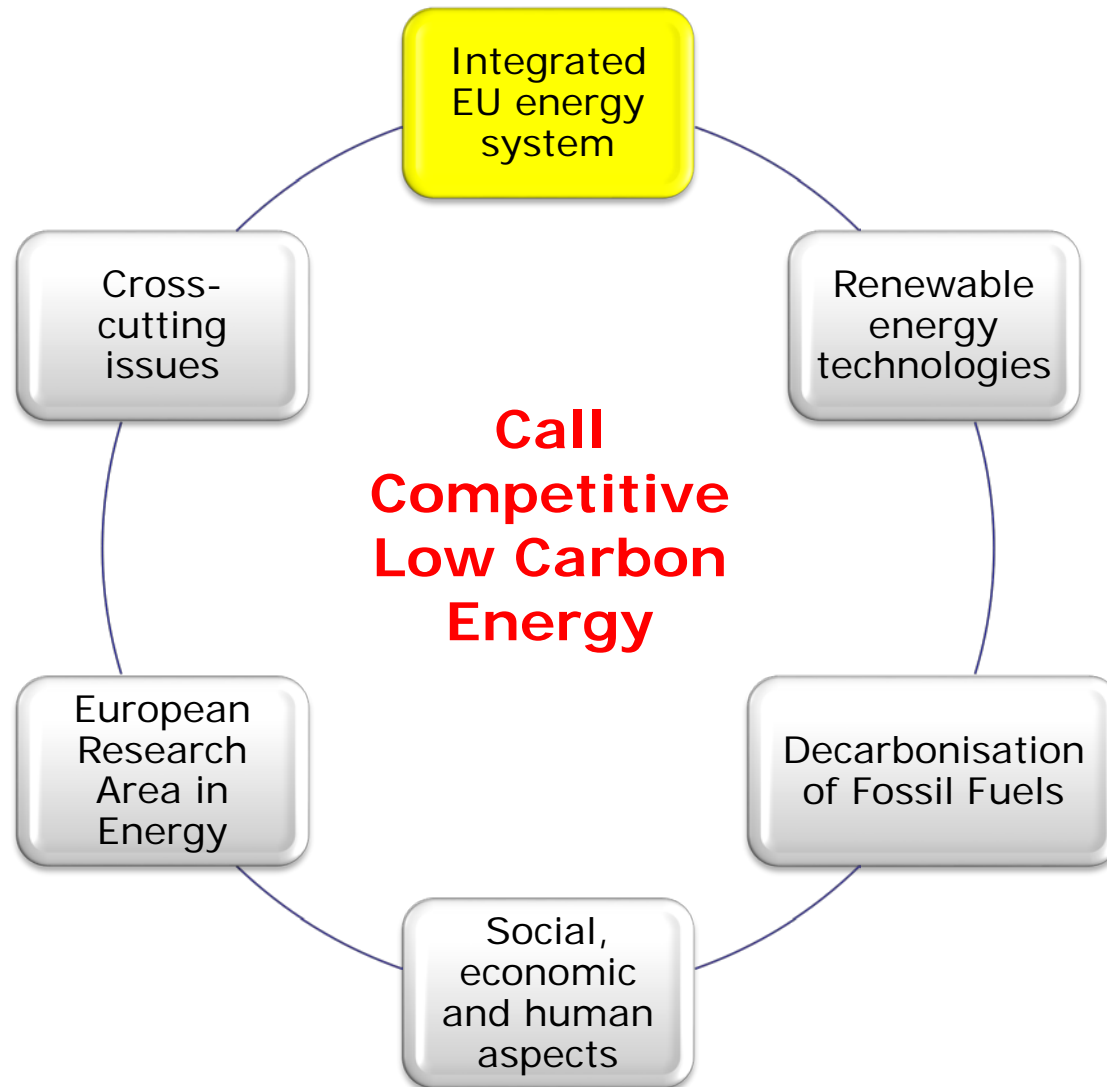
Deadline 7 June 2017

- Sub-budget: EUR 47 million
 - EE-2
 - EE-6
 - EE-9
 - EE-11
 - EE-14
 - EE-15
 - EE-16
 - EE-18
 - EE-19
 - EE-23
 - EE-24
- Sub-budget: EUR 8 million
 - EE-22



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Energy system – Context

Challenges for the European energy system

- Increasing electricity generation and consumption
- Increasing share of renewable energies in electricity generation
- Strong growth of variable RES (wind, solar)
- Huge differences between national energy systems

Energy system – topics 2016

LCE-1

Next generation Distribution Technologies

Research and
Innovation Action
(TRL 3-6)
2-4 M€/project
Budget: 20 M€

Address either

- Storage or
- Synergies between networks

LCE-2

Demonstration of Distribution Technologies

Innovation Action
(TRL 5-8),
12-15 M€/project
Budget: 73,46 M€

Address at least 3 :

- Demand response
- Smartening the distribution grid
- Energy storage and management
- Integration of transport needs

LCE-3

Support to R&I strategy

Coordination and
Support Action (CSA)
1 proposal for up to 4
M€

- Develop R&I Roadmap
- Analyse R&I landscape/projects
- Organise workshops

Energy system – topics 2017

LCE-1

Next generation Distribution Technologies

Research and
Innovation Action
(TRL 3-6)
2-4 M€/project
Budget: 18 M€

Address either

- Demand response
or
- Smart grids

LCE-4

Demonstration of Transmission Technologies

Innovation Action
(TRL 5-8),
15-20 M€/project
Budget: 65,12 M€

Address at least 2 :

- Power transmission
- Large-scale storage
- ICT/tools for flexibility
- Wholesale market

LCE-3

Support to R&I strategy

Research and
Innovation Action
2-4 M€/project
Budget: 28 M€

Address at least 1:

- energy system planning
- Tools for TSO/DSO coordination
- Data handling
- Synergies between gas and electricity
- socio-economics

Energy system - Overview

Deadline 5 April 2016

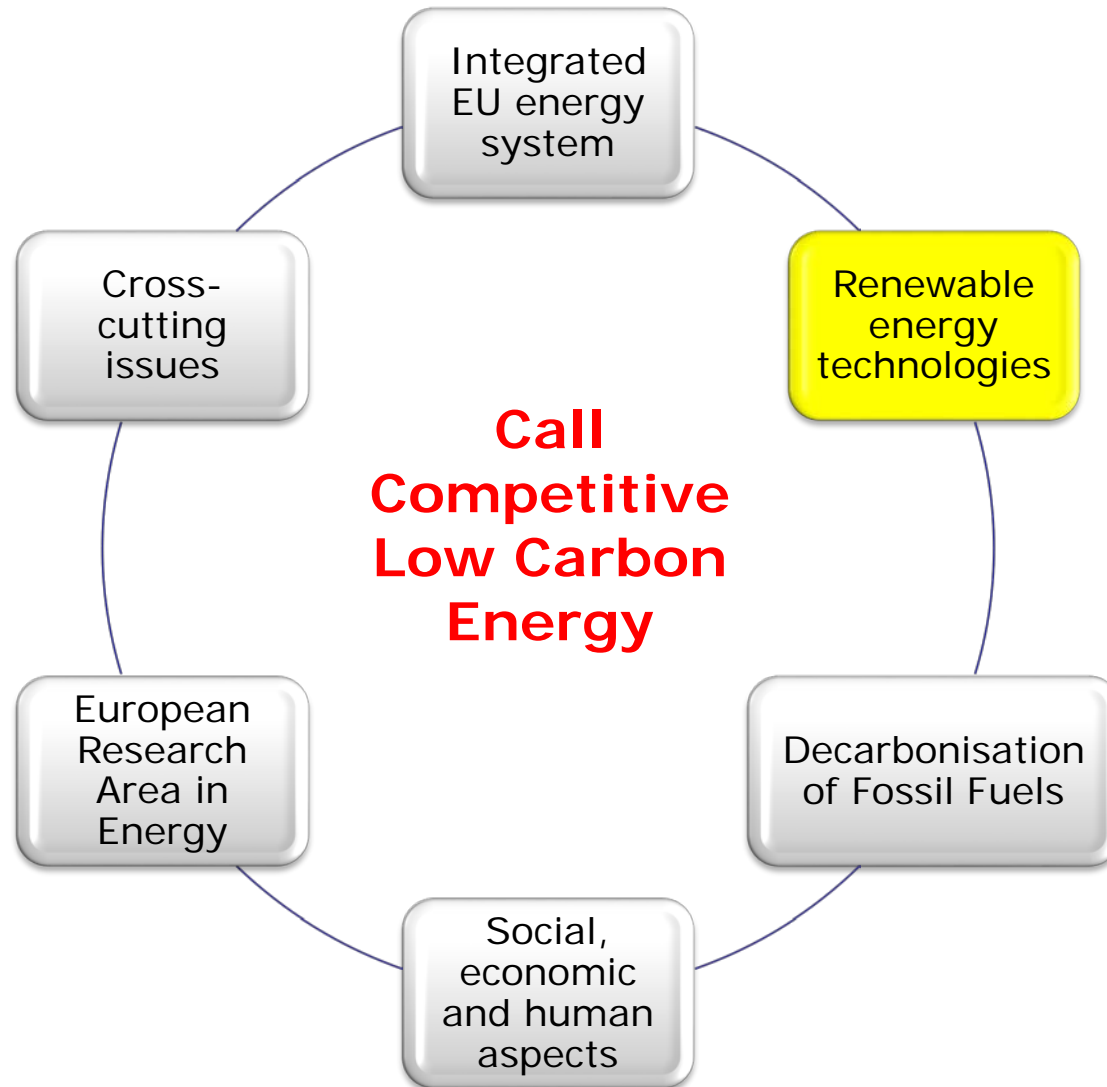
- LCE-1 – budget 20 M€
- LCE-2 – budget 73.46 M€
- LCE-3 – budget 4 M€

IA – green
RIA – blue
CSA- orange

Deadline 14 February 2017

- LCE-1 – budget 18 M€
- LCE-4 – budget 65.12 M€
- LCE-5 – budget: 28 M

N.B.: Revision of topics
and budgets for 2017 in
early next year





Renewable energies - Overview

	Basic Research (TRL <4)	Advanced Research (TRL 3-5)	Demonstration (TRL 5-7)	Market uptake
PV	LCE-6	LCE-7	LCE-9, LCE-10	LCE-21
CSP			LCE-11	
Solar Heating and Cooling			LCE-12	
Wind Energy			LCE-13, LCE-14	LCE-21
Ocean Energy			LCE-15, LCE-16	
Hydropower				
Geothermal Energy			LCE-17, LCE-23, LCE-18	
CHP				
RES integration in the system				
Bio- and Renewable Alternative Fuels			LCE-8, LCE-22	LCE-19, LCE-20



Basic Research

[LCE-06-2017: New knowledge and technologies](#)

Advanced Research

[LCE-07-2016-2017: Developing the next generation technologies of renewable electricity and heating/cooling](#)

[LCE-08-2016-2017: Development of next generation biofuel technologies](#)

Demonstration

[LCE-09-2016: Increasing the competitiveness of the EU PV manufacturing industry](#)

[LCE-10-2017: Reducing the cost of PV electricity](#)

[LCE-11-2017: Near-to-market solutions for reducing the water consumption of CSP Plants](#)

[LCE-12-2017: Near-to-market solutions for the use of solar heat in industrial processes](#)

[LCE-13-2016: Solutions for reduced maintenance, increased reliability and extended life-time of off-shore wind turbines/farms](#)

[LCE-14-2017: Demonstration of large >10MW wind turbine](#)

[LCE-15-2016: Scaling up in the ocean energy sector to arrays](#)



Demonstration (continued)

[LCE-16-2017: 2nd Generation of design tools for ocean energy devices and arrays development and deployment](#)

[LCE-17-2017: Easier to install and more efficient geothermal systems for retrofitting buildings](#)

[LCE-18-2017: Enhanced Geothermal Systems in different geological conditions](#)

[LCE-19-2016-2017: Demonstration of the most promising advanced biofuel pathways](#)

[LCE-20-2016-2017: Enabling pre-commercial production of advanced aviation biofuel](#)

Market Uptake

[LCE-21-2017: Market uptake of renewable energy technologies](#)

International cooperation

[LCE-22-2016: International Cooperation with Brazil on advanced lignocellulosic biofuels](#)

[LCE-23-2016: International Cooperation with Mexico on geothermal energy](#)

Renewable energy – Topic overview

Deadline 16 February 2016

- LCE-7 – budget 61,3 M€
- LCE-8 – budget 10 M€
- LCE-23 – budget 10 M€

Deadline 5 January 2017

- LCE-6 – budget 20 M€
- LCE-7 – budget 66,5 M€
- LCE-8 – budget: 10 M€
- LCE-21 – budget 15 M€

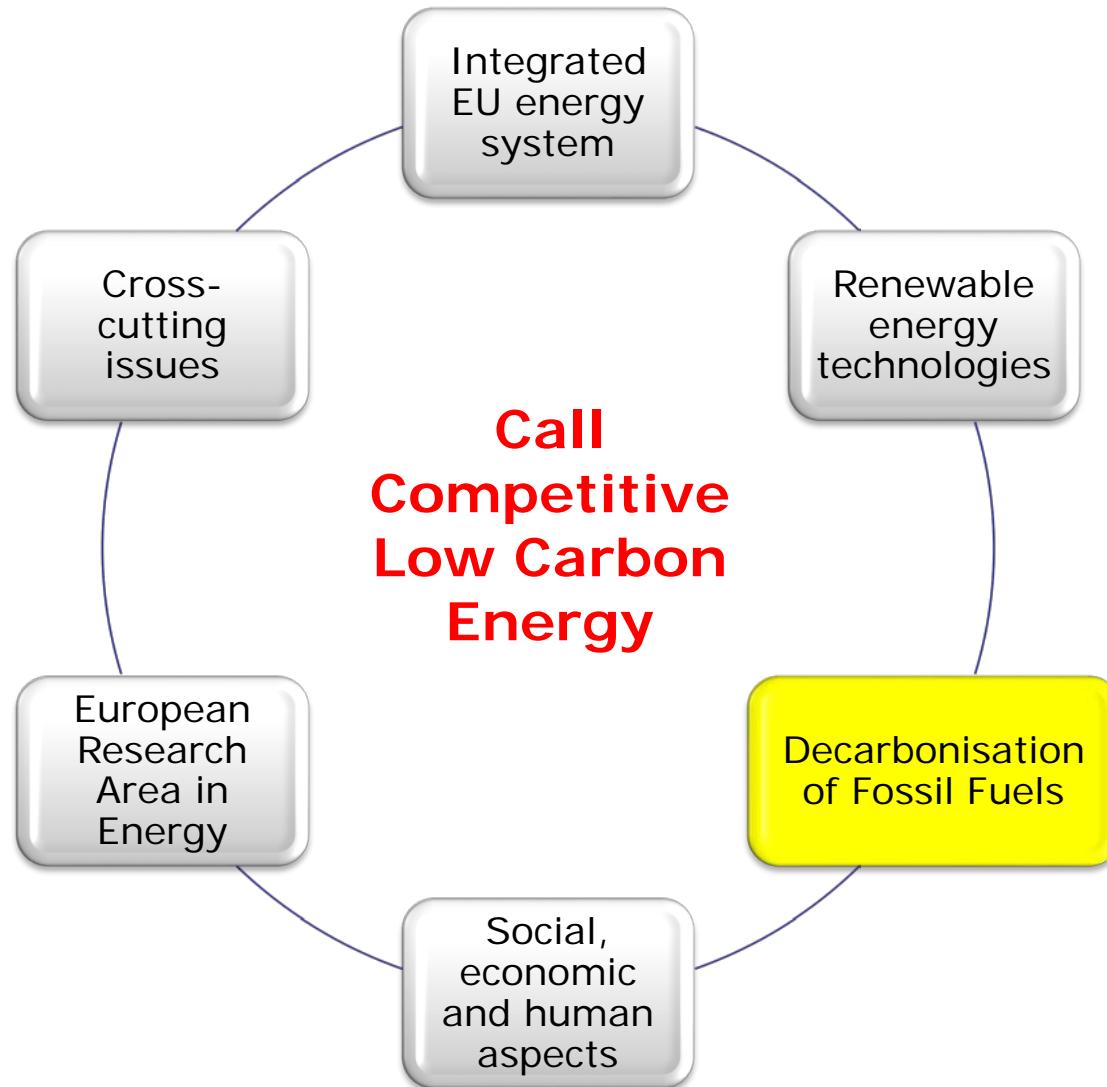
Deadline 8 September 2016

- LCE-9 – budget 25 M€
- LCE-13 – budget 10 M€
- LCE-15 – budget 15 M€
- LCE-19 – budget 15 M€
- LCE-20 – budget 15 M€
- LCE-22 – budget 5 M€

Deadline 7 September 2017

- LCE-10 – budget 10 M€
- LCE-11 – budget 12 M€
- LCE-12 – budget: 8 M
- LCE-14 – budget 25 M€
- LCE-16 – budget 7 M€
- LCE-17 – budget 8 M€
- LCE-18 – budget 10 M€
- LCE-19 – budget 15 M€
- LCE-20 – budget 10 M€

IA – green
RIA – blue
CSA- orange





Decarbonisation of Fossil Fuels - Context

- Fossil fuels will be used in Europe's power generation as well as in industrial processes for decades to come.
- A forward-looking approach to **Carbon Capture and Storage (CCS)** and **Carbon Capture and Use (CCU)** for the power and industrial sectors is crucial for reaching the 2050 climate objectives in a cost-effective way.
- **Shale gas** can contribute to our energy security, provided that issues of public acceptance and **environmental impact** are adequately addressed.
- The integration of (fluctuating) renewable electricity generation in our energy system requires new solutions for fossil fuel power plants to provide **highly flexible yet efficient back-up power** to stabilise the grid.



Decarbonisation of Fossil Fuels – Topics 2016

Activities supported in 2016

LCE-24: New generation high-efficiency capture processes

- TRL 2/3 -> 5; Budget: EUR 17 million (~ 2-5 M€/project)
- Twinning with South Korean projects

LCE-25: Utilisation of captures CO₂ as feedstock for the process industry

- TRL 5/6 -> 6/7; Budget EUR 10 million (~ 6-10 M€/project)

LCE-26: ERA-NET on Applied Geosciences

- Covering ground water, raw materials and geo-energy
- Produce reliable scientific information on resources and potential consequences of their exploitation
- Budget: EUR 10 million; ERA-NET Cofund



Decarbonisation of Fossil Fuels – Topics 2017

Activities supported in **2017**

LCE-27: Measuring, monitoring and controlling the risks of CCS, EGS and unconventional hydrocarbons

- Scope to be defined in 2016

LCE-28: Highly flexible and efficient fossil fuel power plants

- TRL 3 -> 4-6; Budget EUR 15 million (~ 3-6 M€/project)

LCE-29: CCS in industry, including Bio-CCS

- TRL 4/5 -> 7; *budget to be confirmed 2016*

LCE-30: Geological storage pilots

- TRL 4/5 -> 6; *budget to be confirmed 2016*

ERA-NET on Commercial Scale Demonstration of CCS

to be confirmed 2016



Decarbonising Fossil Fuels – Topic overview

Deadline 16 February 2016

- LCE-24 – budget 17 M€
- LCE-25 – budget 10 M€

Deadline 16 February 2016

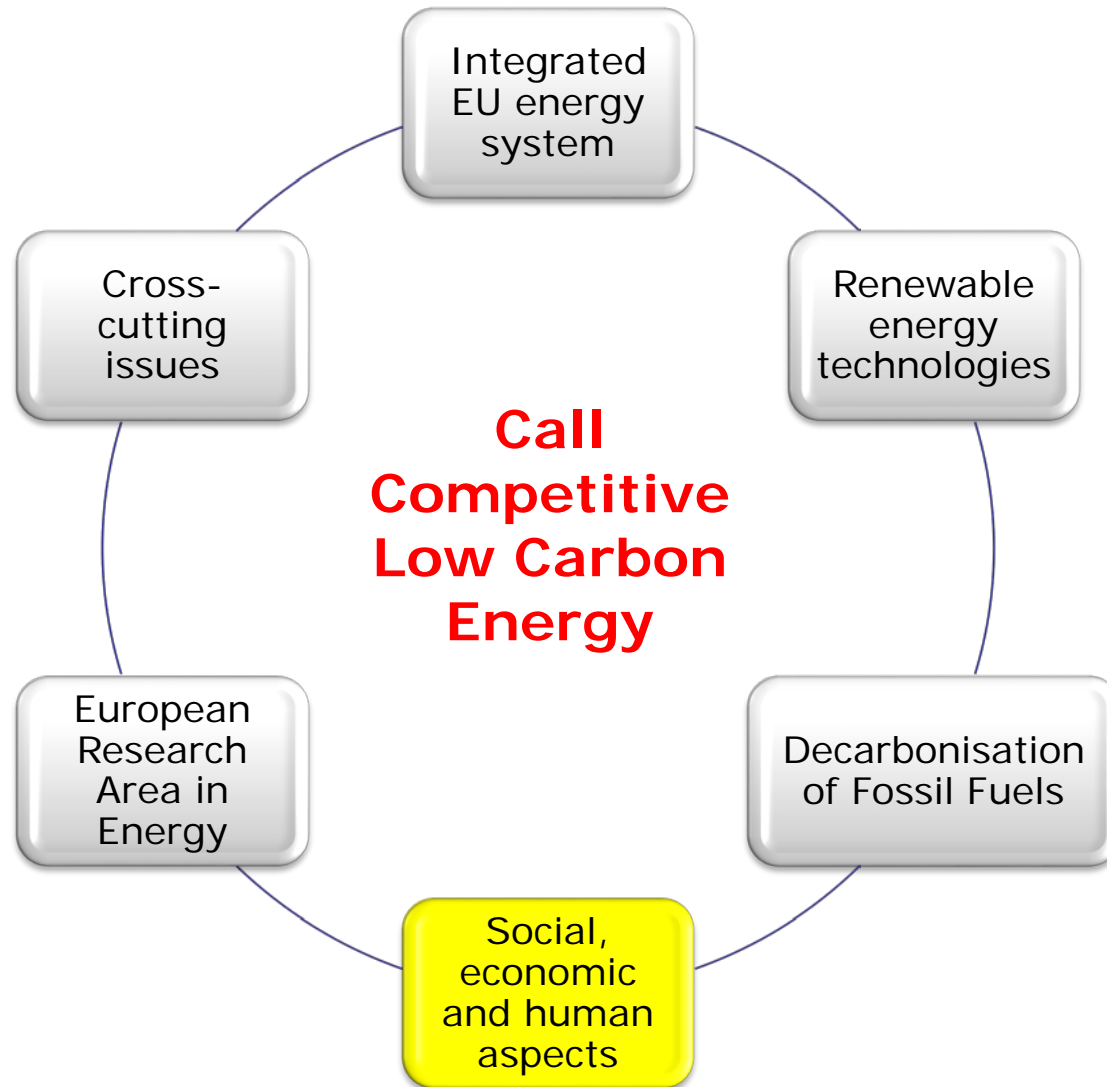
- **LCE-26 – budget 10 M€**

Deadline 5 January 2017

- LCE-27 – budget 15 M€
- LCE-28 – budget 15 M€
- LCE-29*
- LCE-30*

** The budget for topics LCE-29 and LCE-30 will be confirmed in the first half 2016. In case the ERA-NET on CCS demonstration will be supported, both topics will be withdrawn due to budget constraints.*

RIA – blue
ERA-NET - black





SSH-related topics

Social Sciences in support of the Energy Union (*LCE-31-2016-2017*)

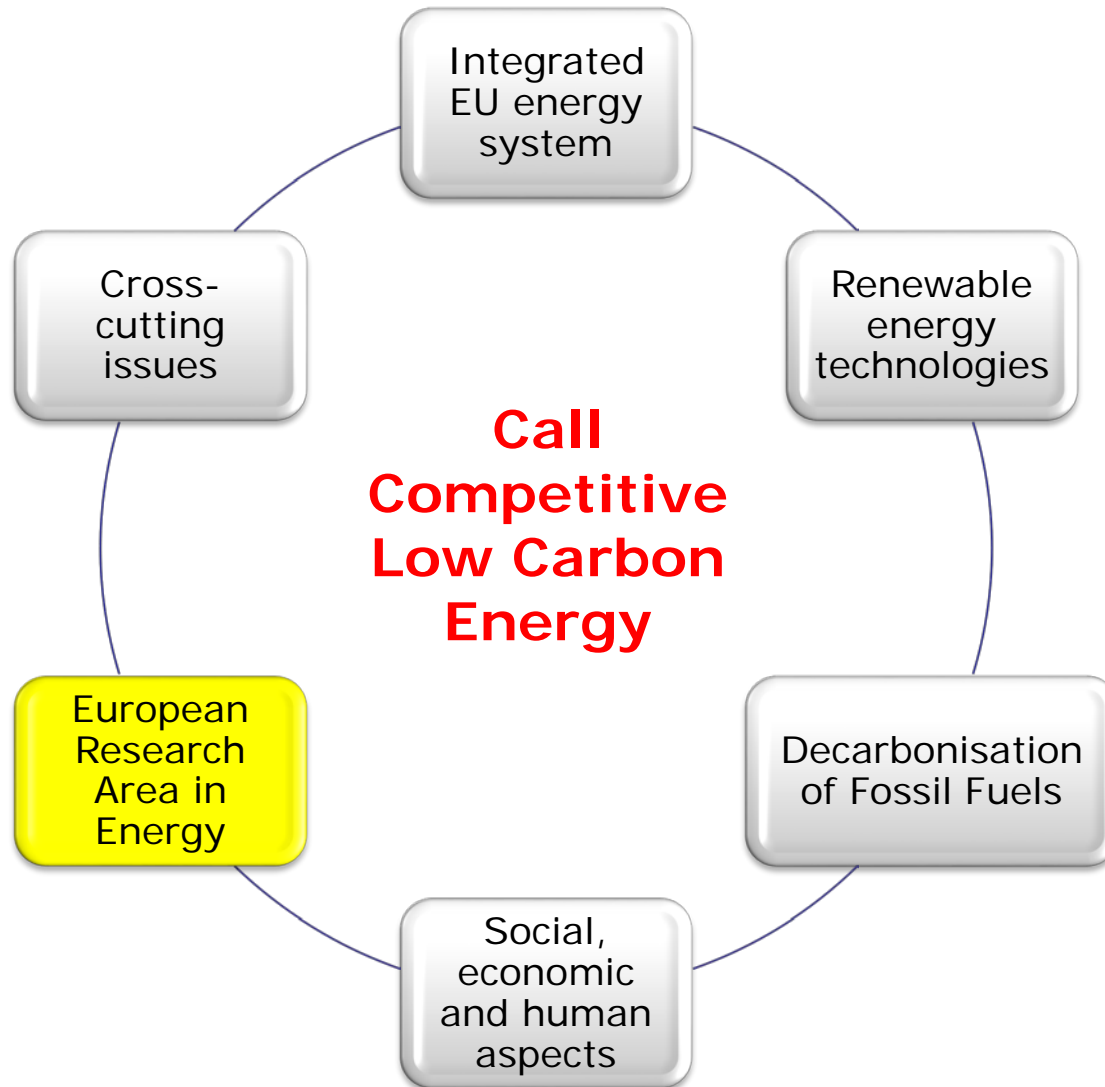
- **Focus 2016:** Energy-related choices and behaviour
- **Focus 2017:** Socioeconomic incentive structures, and political, institutional and organizational frameworks
- **Budget:** EUR 10 million for both 2016 and 2017 (~ 2-4 M€/project)
- **Deadlines:** 16 February 2016; 5 January 2017

European Platform for energy-related SSH research (*LCE-32-2016*)

- Setting up a new European platform to integrate existing energy-related SSH networks, identify research gaps for SSH and strengthen the dialogue among different stakeholders
- **Budget:** EUR 1.7 million (Coordination and Support Action – CSA)
- **Deadline:** 5 April 2016

Main-streaming of SSH

- For example topics EE-8, LCE-6, LCE-7, LCE-11, LCE-15, LCE-17, LCE-18, LCE-19, LCE-20, LCE-22, LCE-28





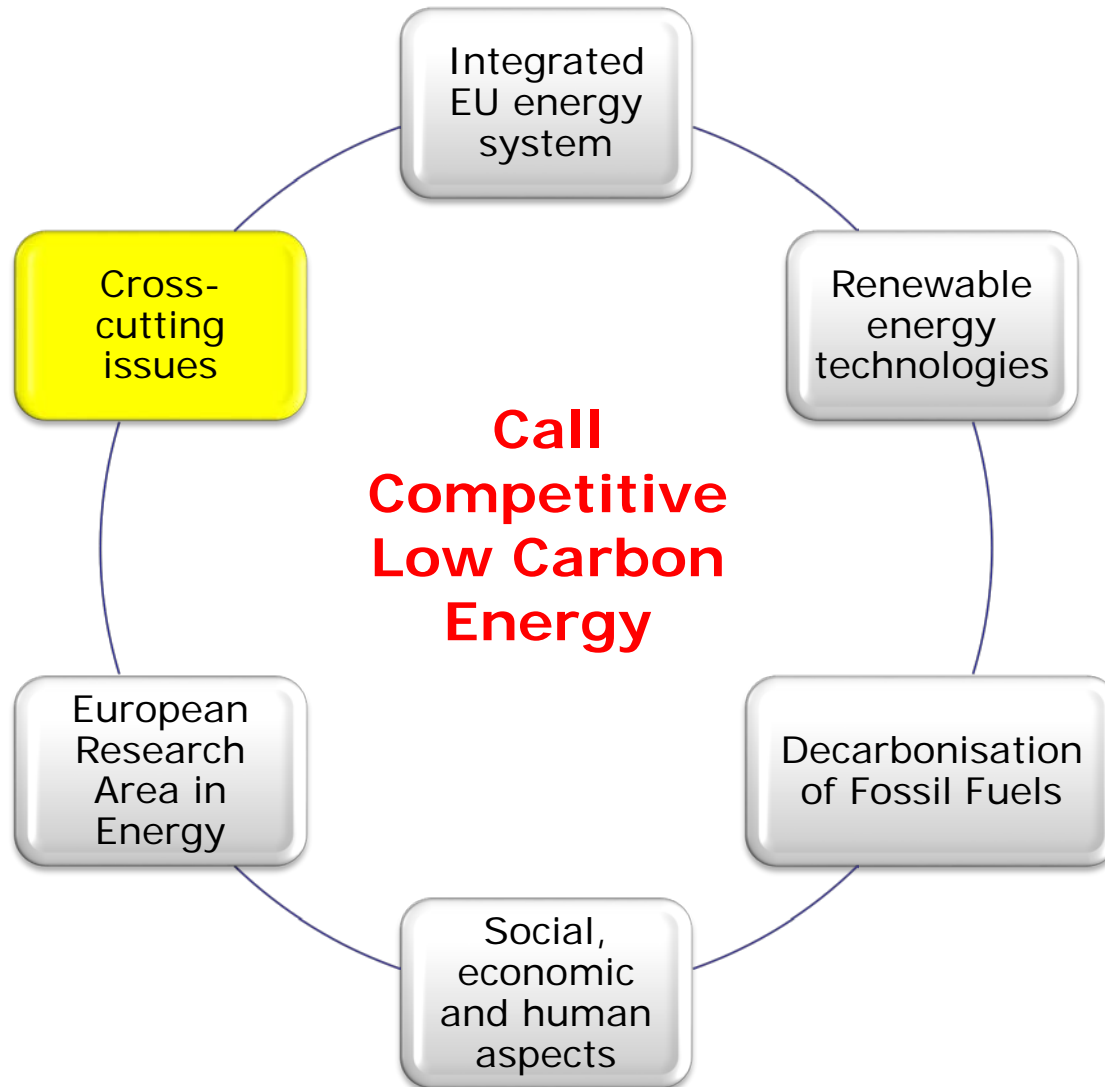
European Research Area in Energy

**ERA-NETs (LCE-34,
LCE-35 + OA#62,
LCE-26, EE-21)**

- Focus on demonstration projects and encouraging industrial participation
- Eligible participants: only programme owner and programme managers
- Combination of national and European funding.
- Budget LCE-34-2016: 30.8 M€
- Approach for 2017 to be reviewed in 2016

**European Common
Research and
Innovation
Agendas (ECRIA,
LCE-33)**

- Creating a transnational critical mass of research capacity in a certain area.
- Combination of national and European funding.
- Addressing integration aspect of the energy system.
- TRLs 2 -> 5; clear deliverables
- Deadline: 5 April 2016; Budget: 10 M€





Cross-cutting issues

**Support to the energy stakeholders to contribute to the SET-Plan
(LCE-36-2016-2017)**

- Areas supported:
 - **Photovoltaics**
 - **Ocean energy**
 - **Zero emission fossil fuel power plants and energy intensive industry**
 - **Biofuels**
- Coordination and support action (up to one project per area)
- Budget: 2.4 M€ (~ 0.6 M€ / project)
- Recommended grant duration: 2 years
- Deadline: 16 February 2016



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Smart Cities and Communities

Topic SCC-1-2016-2017 (TRL 7 and more):

- Sustainable, cost-effective and replicable district-scale solutions at the intersection of energy and transport enabled by ICT
 - Intelligent, user-driven and demand-oriented city infrastructure and services
 - Continuation of the 'Lighthouse project' approach
 - Integrating smart buildings, smart grids, energy storage, electric vehicles, smart charging infrastructures and the latest generation of ICT platforms based on open specifications
-
- **Budget:** 60 M€ in 2016 and 71,5 M€ for 2017 (12-18 M€ per project)
 - **Deadlines:** 5 April 2016 and 14 February 2017
 - Part of the '**Smart and Sustainable Cities**' call which also includes actions on sustainable cities through nature-based solutions



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The SME Instrument

3 phases of support (no need to start with phase 1)

1. **Business innovation grants** (feasibility studies, lump sum of EUR 50,000 per project);
 2. **Business innovation grants for innovation development & demonstration purposes** (between EUR 0.5 – 2.5 million / project)
 3. **Free-of-charge business coaching**, access to a wide range of innovation support services and facilitated access to risk finance to facilitate the commercial exploitation of the innovation.
- ✓ 4 submission deadlines per year for phase 1 and 2
- ✓ Budget for the Energy SME topic (SMEInst-09-2016-2017):
- ✓ **46 M€ in 2016**
 - ✓ **50 M€ in 2017**



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Fast-track to Innovation Pilot

- Innovation from the demonstration stage through to market uptake (starting as of TRL 6)
- Completely bottom-up – covers all areas addressed by H2020
- Small consortia with strong participation from industry
- Business plans mandatory
- 3 submission deadlines in 2016 (15/3, 1/6, 25/10/2016)
- Budget 100 M€ (no earmarking for areas)



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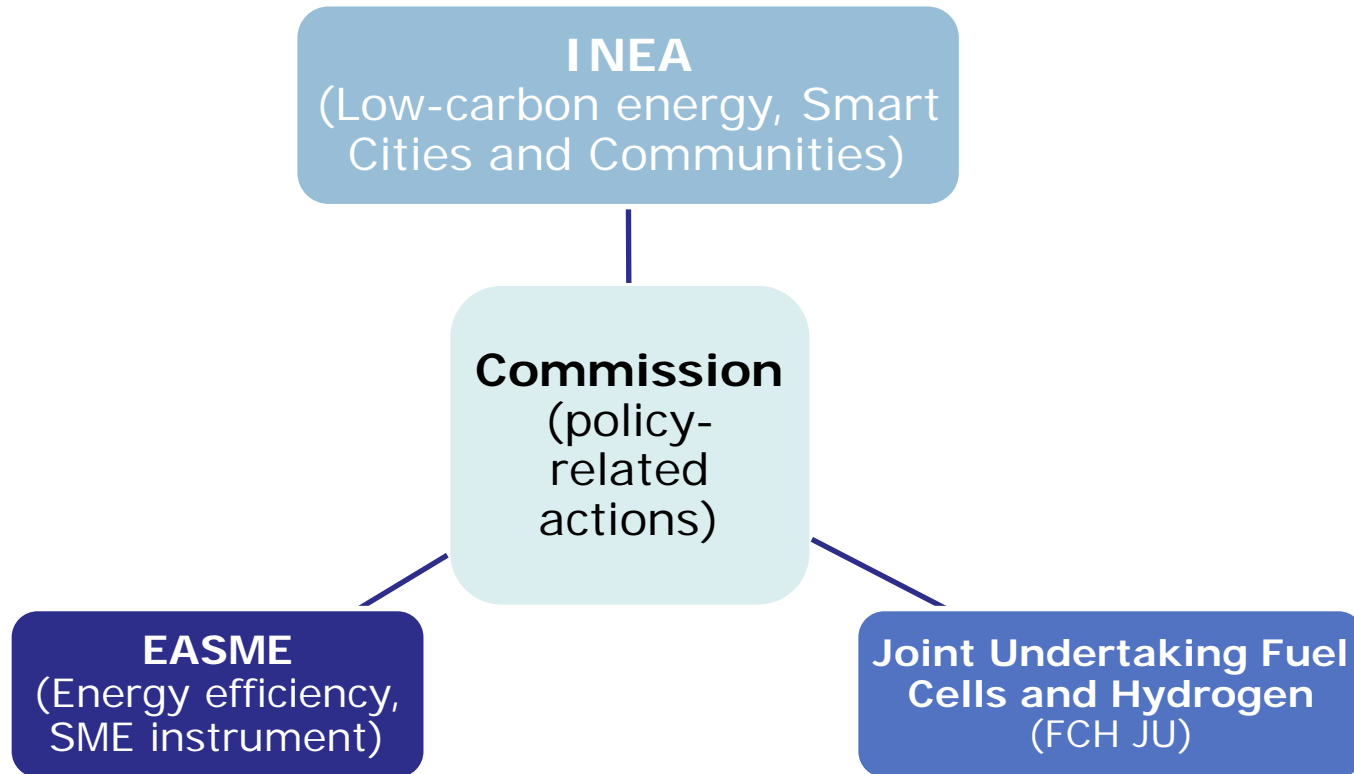
Horizon Prizes in Energy

New instrument to generate breakthroughs and induce innovation in low carbon energy technologies

Title	Budget (EUR million)	Publication of the contest	Submission of proposals
CO2 reuse (Innovative products utilising CO ₂)	€1.5	3 quarter 2016	Until 2nd quarter 2019
Combined Heat and Power(CHP) Installation with 100% RES (hospital with a perfectly integrated CHP installation)	€ 1.0	3 quarter 2016	Until 2nd quarter 2019
Integrated Photovoltaic System (European protected historic urban district with PV system in its buildings)	€ 0.75	3 quarter 2016	Until 3rd quarter 2018



Implementation of the Energy Challenge





Implementation of the Energy Challenge

European Commission

Defines the policy

- Defines strategy, objectives and priority areas/work programmes
- Selects projects for co-financing
- Makes programme decisions
- Evaluates the programme and the Agency's performance

Executive Agency

Turns policy into action

- Organises Calls for proposals
- Monitors the technical and financial implementation of projects
- Ensures sound financial management
- Manages project life-cycle



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Time to Grant

A maximum Time-to-Grant of 8 months

5 months

for informing all applicants
on scientific evaluation

But likely earlier

up to 8 months

for signature of GA

*Some exceptions apply, including complex actions or where
requested by applicants*



International Cooperation

Open to the World

General opening

- Participation to all international partners
- Common interest, mutual benefits
- Direct participants to grant agreements or as third parties

Dedicated Actions

Targeted openings & Coordinates calls

- Encouraged or required participation
- Specific international partners

Other cooperation

- Exploring other types of cooperation (on-going)



Types of actions

Research and Innovation Action (RIA)

- 100% funding rate
- At least 3 legal entities from 3 different MS/AC

Innovation Action (IA)

- 70% funding rate (but 100% for non-profit organisations)
- At least 3 legal entities from 3 different MS/AC

Coordination and Support Action (CSA)

- accompanying measures
- 100% funding rate
- At least 1 legal entity from MS/AC

ERA-NET Cofund

- support public-public partnerships
- At least 3 legal entities from 3 different MS/AC
- participants must be 'research funders'



Admissibility criteria set in the WP

➤ Proposals must be

- submitted in the electronic submission system (no paper, email submissions)
- before the deadline
- readable, accessible and printable.

➤ Proposals must be complete:

- Include administrative data, the proposal description, and any supporting documents specified in the call
- Include supporting documents for operational capacity (CVs, up to 5 prior publications/products, up to 5 prior projects, major infrastructure, third parties)

➤ Proposals **must** include **draft plan for the exploitation and dissemination of the results**



More Information

Participants Portal:

<http://ec.europa.eu/research/participants/portal/desktop/en/home.html>

Research Enquiry Service:

<http://ec.europa.eu/research/index.cfm?pg=enquiries>

Presentations of the Energy Info Day 2015:

<https://ec.europa.eu/inea/en/H2020-Energy-Infoday-presentations>

Horizon 2020 Homepage:

<http://ec.europa.eu/programmes/horizon2020/>

Joint Undertaking on Fuel Cells and Hydrogen (FCH JU): <http://www.fch.europa.eu>



**Thank you for your
attention**





Photovoltaics (PV)

Rationale:

- High power generation potential;
- Reducing the total cost of installed solar energy systems and grid-integration bottlenecks remains a priority for the sector;
- PV R&D is necessary to re-launch an innovative and worldwide competitive industry relying on the existing PV technology knowledge-base in Europe.

Basic research

- Upscaling technologies currently at lab-scale (!excluding activities funded under NMBP 19-2016!) - *LCE-6-2017*

Advanced research

- Next generation of c-Si (2016) and perovskite (2017) PV cells and modules – *LCE-7-2016-2017 (no ringfenced budget)*

Demonstration

- Manufacturing innovations at pilot-line level for industrial production of cells and modules – *LCE-9-2016 (EUR 25 million)*
- Reducing cost of PV electricity – *LCE-10-2017 (EUR 10 million)*

Market-uptake

- Tackling the bottlenecks of high penetration levels of PV electricity into the electric power network – *LCE-21-2017 (no ringfenced budget)*



Concentrated Solar Power (CSP)

Rationale:

- Strong European industrial presence but the larger share of the market is outside Europe. The competition is growing.
- Need to reduce further the capital and the operational costs as well as to improve system operations, performances and environmental footprint (water consumption).

Basic research

- Upscaling technologies currently at lab-scale - *LCE-6-2017*

Advanced research

- Innovative components and configurations for reducing costs of CSP plants – *LCE-7-2016*
- New cycles and power blocks for reducing costs of CSP plants – *LCE-7-2017*

Demonstration

- Reducing water consumption of CSP plants – *LCE-11-2016 (EUR 12 million)*

Market-uptake

- Facilitating the supply of electricity from CSP plants in Southern Europe to Central and Northern European countries – *LCE-21-2017*



Solar Heating and Cooling

Rationale:

- Mature technology exists but it still remains under-exploited;
- New technology is needed to enlarge the application sectors;
- Issues of cost, performance and operability still exist;
- Cost competitiveness and acceptability of solar heating systems need to be improved.

Basic research

- Upscaling technologies currently at lab-scale - *LCE-6-2017*

Advanced research

- Innovative components for solar compact hybrid systems – *LCE-7-2016*
- Development of components for residential single-family solar-active houses – *LCE-7-2017*

Demonstration

- Solar heat in industrial processes – *LCE-12-2016 (EUR 8 million)*



Geothermal energy

Rationale:

- Geothermal energy has great untapped potential for diversifying the energy mix.
- "Shallow geothermal": retrofitting existing installations with improved technology;
- Enhanced geothermal systems (EGS): reduction of drilling costs and risks; demonstration of viable technologies to create new reservoirs.

Basic research

- Upscaling technologies currently at lab-scale - *LCE-6-2017*

Advanced research

- Improving borehole heat exchanger (shallow geothermal) – *LCE-7-2016*
- Materials for geothermal installations (deep geothermal) – *LCE-7-2017*
- International cooperation with Mexico (deep geothermal) – *LCE-23-2016* (EUR 10 million)

Demonstration

- Geothermal systems for retrofitting buildings – *LCE-17-2016* (EUR 8 million)
- EGS in different geological conditions – *LCE-18-2017* (EUR 10 million)

Market-uptake

- Tackling bottlenecks for high penetration – *LCE-21-2017*
- Accelerating the penetration of heat pumps for heating and cooling – *LCE-21-2017*



Wind energy

Rationale:

- European industries are still world leaders but the competition is growing;
- Cost reductions for all components essential, in particular for offshore;
- Offshore considered as the future market - large turbines to be demonstrated
- Issues remain on environmental and social impact, and on public acceptance

Basic research

- Improved understanding of the physics of wind as primary energy source and wind energy technology - *LCE-6-2017*

Advanced research

- Advanced control of large-scale wind turbines and farms – *LCE-7-2016*
- Reduction of environmental impact – *LCE-7-2017*

Demonstration

- Solutions for reduced maintenance, increased reliability and extended life-time of off-shore wind turbines/farms – *LCE-13-2016 (EUR 10 million)*
- Large >10 MW wind turbines – *LCE-14-2017 (EUR 25 million)*

Market-uptake

- Increase market share of wind energy – *LCE-21-2017*



Ocean energy

Rationale:

- European industries are leading the emergence of the technologies.
- Many devices developed / prototypes tested, but market potential yet to be realised.
- Demonstration of reliable and survivable systems essential.
- Environmental, social and public impacts to be addressed

Basic research

- Upscaling technologies currently at lab-scale - *LCE-6-2017*

Advanced research

- Increased performance and reliability of ocean energy sub-systems – *LCE-7-2016*
- Innovative power take-off systems and control strategies – *LCE-7-2017*

Demonstration

- Scaling up in the ocean energy sector to arrays – *LCE-15-2016 (EUR 15 million)*
- Design tools for ocean energy devices and arrays development/deployment – *LCE-16-2017 (EUR 7 million)*

Market uptake

- Multi-use of the oceans' marine space, offshore and near-shore: compatibility, regulations, environmental and legal issues (CSA), *BG-3-2016*, Budget: EUR 2 million



Combined Heat and Power (CHP)

Rationale:

- CHP installations already in use, commercial applications exist and have been supported under previous framework programmes
- Market potential for residential scale and for specific industrial applications to increase generation flexibility.

Basic research

- Upscaling technologies currently at lab-scale - *LCE-6-2017*

Advanced research

- Highly efficient, low emission, medium- and large-scale biomass-based CHP systems – *LCE-7-2016*
- Transforming renewable energy into intermediates – *LCE-7-2017*



Integration of RES in the energy system

Rationale:

- Growing share of renewable energy sources requires rethink of system management;
- Complementing activities supported under the area '*Integrated EU energy system*', integration is also addressed from the perspective of the generation sources in order to share burden and costs.

Advanced research

- LCE-7-2016-2017:
 - Developing system support functions enabling RES technologies to contribute - at transmission and distribution grid level - to a stable and safe energy system;
 - Define most suitable pathways for including integration considerations into the different RES development roadmaps



Biofuels (1/2)

Rationale:

- European industries have leading technologies, but currently little deployment in EU;
- Biofuels are medium-term solution for road and maritime transports and the only solution for air transport;
- Both biological and thermo-chemical pathways are necessary to provide technology diversity, but the challenges in each pathway are different;
- Large scale demonstrations are needed to boost market access;
- Research needed to reduce cost, improve environmental impact and performance efficiency.

Basic research

- Diversification of renewable fuel production through novel conversion routes/fuels - LCE-6-2017

Advanced research

- LCE-8-2016-2017: Next generation of:
 - *Paraffinic biofuels from sugar through chemical and/or biochemical pathways (2016)*
 - *Biofuels from pyrolysis or hydrothermal liquefaction (2016)*
 - *Synthetic biofuels/hydrocarbons through biomass gasification (2016)*
 - *Biofuels from CO₂ in industrial waste flue gases or other waste through different pathways (2017)*
 - *Biofuels from phototropic algae / bacteria (2017)*



Biofuels (2/2)

Advanced research

- Cooperation with Brazil on advanced lignocellulosic biofuels - *LCE-22-2016 (EUR 5 million)*

Demonstration

- *LCE-19-2016-2017* (EUR 15 million for each 2016 and 2017)
 - Biomass gasification (2016)
 - Biomass pyrolysis and torrefaction to intermediate bioenergy carriers (2016)
 - Biochemical conversion to diesel and jet fuels (2016)
 - Biofuels from waste flue gases / other wastes and residues (2017)
 - Biomass from aquatic biomass (2017)
- Pre-commercial production of advanced aviation biofuels – *LCE-20-2016-2017* (EUR 15 million in 2016; EUR 10 million in 2017)

Market-uptake

- Market roll-out of liquid advanced biofuels and liquid renewable alternative fuels – *LCE-21-2017*



Renewable energy – Topic overview

Deadline 16 February 2016

- LCE-7 – budget 61,3 M€
- LCE-8 – budget 10 M€
- LCE-23 – budget 10 M€

Deadline 5 January 2017

- LCE-6 – budget 20 M€
- LCE-7 – budget 66,5 M€
- LCE-8 – budget: 10 M€
- LCE-21 – budget 15 M€

Deadline 8 September 2016

- LCE-9 – budget 25 M€
- LCE-13 – budget 10 M€
- LCE-15 – budget 15 M€
- LCE-19 – budget 15 M€
- LCE-20 – budget 15 M€
- LCE-22 – budget 5 M€

Deadline 7 September 2017

- LCE-10 – budget 10 M€
- LCE-11 – budget 12 M€
- LCE-12 – budget: 8 M
- LCE-14 – budget 25 M€
- LCE-16 – budget 7 M€
- LCE-17 – budget 8 M€
- LCE-18 – budget 10 M€
- LCE-19 – budget 15 M€
- LCE-20 – budget 10 M€

IA – green
RIA – blue
CSA- orange