EU funding for Smart Energy Systems

Andreea STRACHINESCU

Head of Unit - New energy technologies and innovation – DG Energy

European Commission

Brussels, 7th if June 2018

European Challenges

Modernise our economy by bringing down greenhouse gas emissions while creating jobs and growth

The EU as the **world leader on renewable energy** and placing **energy efficiency first** based on new technologies and **industrial leadership**

Ensure a socially fair transition where **regions, cities and consumers** play an active role

Energy Union

5 GUIDING DIMENSIONS

2

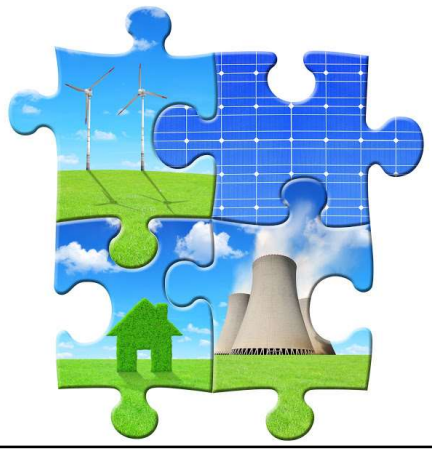
European Commission

LEGISLATIVE PROPOSALS

3

European Commission

The transformation of the energy system starts with innovation



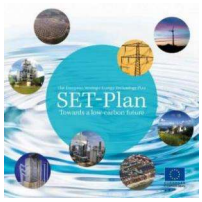
EU energy R&I policy

European Commission

Energy Union

5 GUIDING DIMENSIONS

SET-Plan



Clean energy for all Europeans

Smart Cities

H2020

bridge HORIZON 2020

5

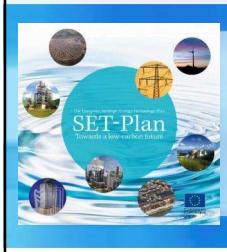
European Commission

#energyunion

secure, sustainable, competitive, affordable energy for all Europeans

5th dimension:
Research & innovation

The Strategic Energy Technology (SET) Plan



- Adoption in 2008
- Set-up of European Industrial Initiatives for technologies and coordination of the research actions of EU and Member States for technologies with market impact up to 2020 and beyond

- Integrated SET Plan Communication (2015)
- Technologies and innovation Platforms (industry and Member States) and four core priorities (RES, consumers, cities, energy efficiency, sustainable transport – supporting the Energy Union) + CCS and nuclear
- 10 Key Actions

7

The Strategic Energy Technology Plan (SET-Plan)

Overall objective: Accelerating the development and deployment of low-carbon technologies through cooperation among EU countries, companies, research institutions, and the EU itself, based on **common priorities, targets and actions**.

Priority Actions:

1+2. Improving performance and reducing cost of renewable energy
3. Smart solutions for consumers
4. Smart Resilient and Secure Energy System
5. Energy Efficiency in Buildings
6. Energy Efficiency in Industry
7. Batteries and e-Mobility
8. Renewable Fuels and Bioenergy
9. Carbon Capture Utilisation and Storage
10. Nuclear Safety

Defining priorities •SET-Plan Communication 2015

Setting targets •Declaration of Intents

Implementation Plans (IP) •Temporary Working Groups

Execution of IPs

European Commission

SET plan Working Groups relevant to Smart Cities

- Smart solutions for energy consumers
- Smart cities and communities
- Smart energy systems
- New materials and technologies for EE solutions for Buildings
- Cross cutting Heating and Cooling technologies for buildings

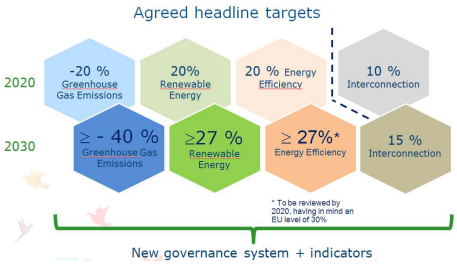
Main Targets focusing on:

- **Positive energy blocks**
- **Reduction of low energy house cost**
- **increased efficiency of Heating/Cooling technologies**
- **Increased flexibility of the energy system**

Policy Framework

"Clean Energy for all Europeans"

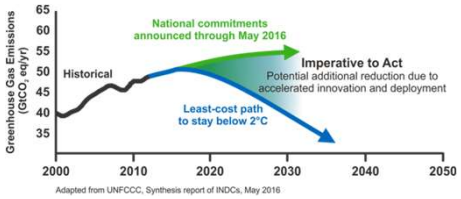
- *Putting energy efficiency first*
- *Demonstrating global leadership in renewables*
- *Delivering a fair deal for consumers*



Paris Agreement

*Holding the increase in the global average temperature to **well below 2°C** above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels*

*Accelerating, encouraging and enabling **innovation** is crucial...*



Other EU policy priorities

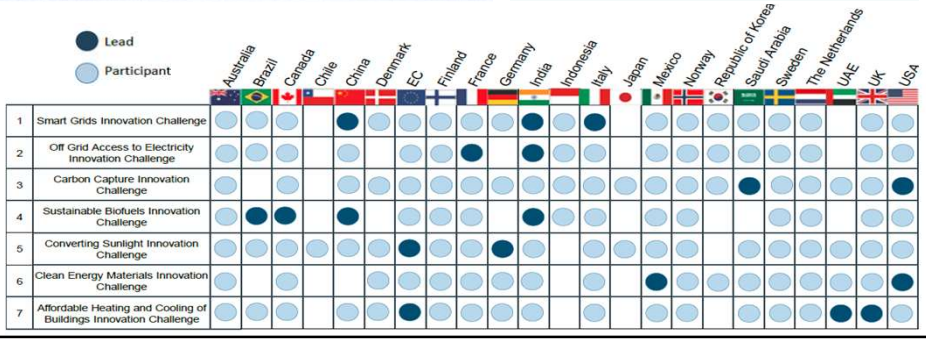
- Digital Single Market
- Jobs, Growth and Investments
- EU as a strong global actor
- …

European Commission

Policy Framework

Mission Innovation

Overall objective: To reinvigorate global efforts in clean energy innovation, Mission Innovation members share a common goal to **develop and scale** breakthrough technologies and substantial **cost reductions**. MI members aim to seek to **double public clean energy research and development investment** over five years.



Policy Framework

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European Commission

Horizon 2020 Work programme 2018-2020

Horizon 2020 work programme 2018-2020

- Total budget envelope: ~ EUR 30 billion
- Covering **18 programme parts** (e.g. Energy Challenge) contributing to various extents to **focus areas** (virtually linked calls)

Energy Challenge WP 2018-2020

Focus Areas

- EUR 1953 million — ***Building a low-carbon, climate resilient future***
- EUR 12 million — ***Connecting economic and environmental gains – the Circular Economy***
- EUR 30 million — ***Digitising and transforming European industry and services***
- EUR 20 million — ***Boosting the effectiveness of the Security Union***

Texts for calls:

- **2018 –** finalised
- **2019 –** to be confirmed mid-2018
- **2020 –** to be added as of mid-2018

European Commission

Energy across Horizon 2020

Energy is also addressed in many other Horizon 2020 parts

Bottom-up activities

- European Research Council (ERC)
- European Innovation Council (SME instrument, FTI pilot, FET, Prizes)
- Marie-Sklodowska Curie Actions

Industrial Leadership

- Materials
- PPPs on Energy-efficient Buildings and SPIRE
- Information and Communication Technologies
- Space (Galileo)

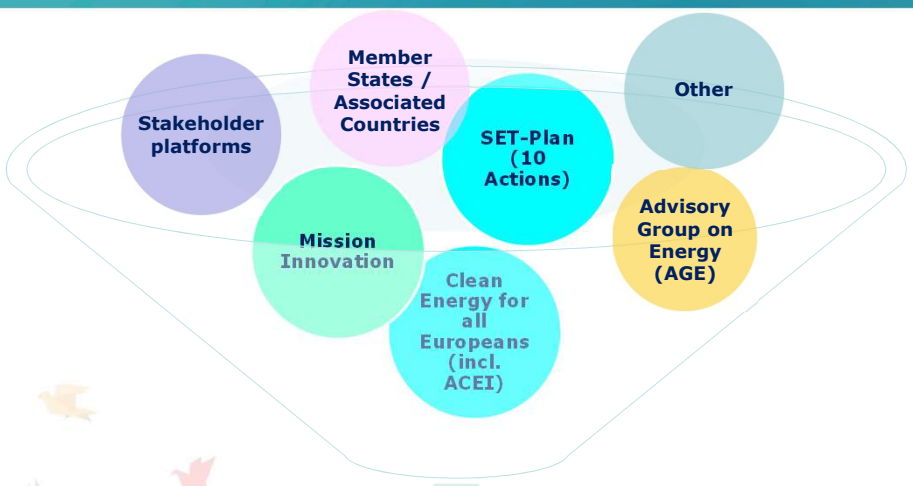
Societal Challenges (SC)

- SC2: Bioeconomy, Blue Growth
- SC4: Electric vehicles, Batteries, Energy-efficient transport
- SC5: Cities, Earth observation, raw materials, climate change mitigation strategies
- SC7: Cybersecurity, Critical energy infrastructure

-> Please check also calls of other Horizon 2020 parts!

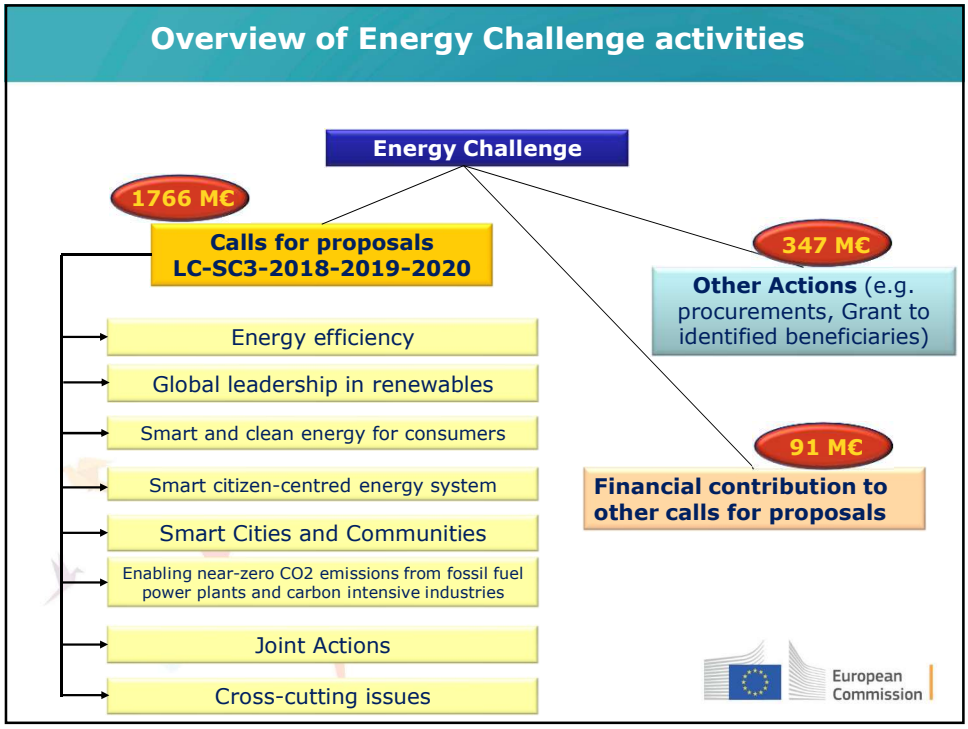
European Commission

Inputs to the work programme 2018-2020



Energy WP 2018-2020

European Commission


Overview of Energy Challenge activities
Energy Challenge
1766 M€
Calls for proposals
LC-SC3-2018-2019-2020
347 M€
Other Actions (e.g. procurements, Grant to identified beneficiaries)
91 M€
Financial contribution to other calls for proposals
Energy efficiency
Global leadership in renewables
Smart and clean energy for consumers
Smart citizen-centred energy system
Smart Cities and Communities
Enabling near-zero CO2 emissions from fossil fuel power plants and carbon intensive industries
Joint Actions
Cross-cutting issues
European Commission


SCC
Smart Cities and Communities
European Commission

Technology is just an enabler for people living, working or visiting a city

SCC

European Commission

- 14 Member States
- Cities, Industry & research
- Streamlining funding programmes
- Research agenda – next decade

SCC

- SET Plan Conference -11th edition
- 19th – 21st of November 2018 in Vienna, Austria

HORIZON 2020

European Commission

- Strategic partnerships between European cities and industry
- Develop common solutions
- Scale up
- Integrated approaches
- Replication

SCC

- Collaboration with Lighthouse projects
- Get involved at http://eu-smartcities.eu
- G.A. on 28th of June in Sofia, Bulgaria

European Commission

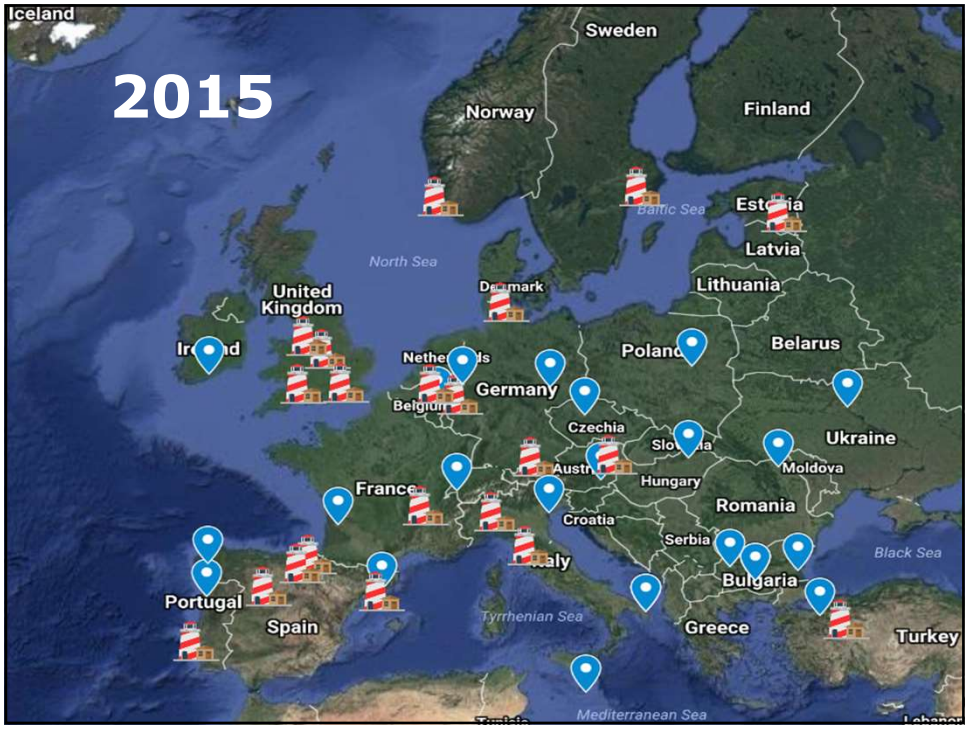
- €270 million co-funding so far (calls 2014-2017)
- Strong brand
- Leading the way
- Critical mass: 36 + 42 cities and growing
- Call 2018 to be finalised soon

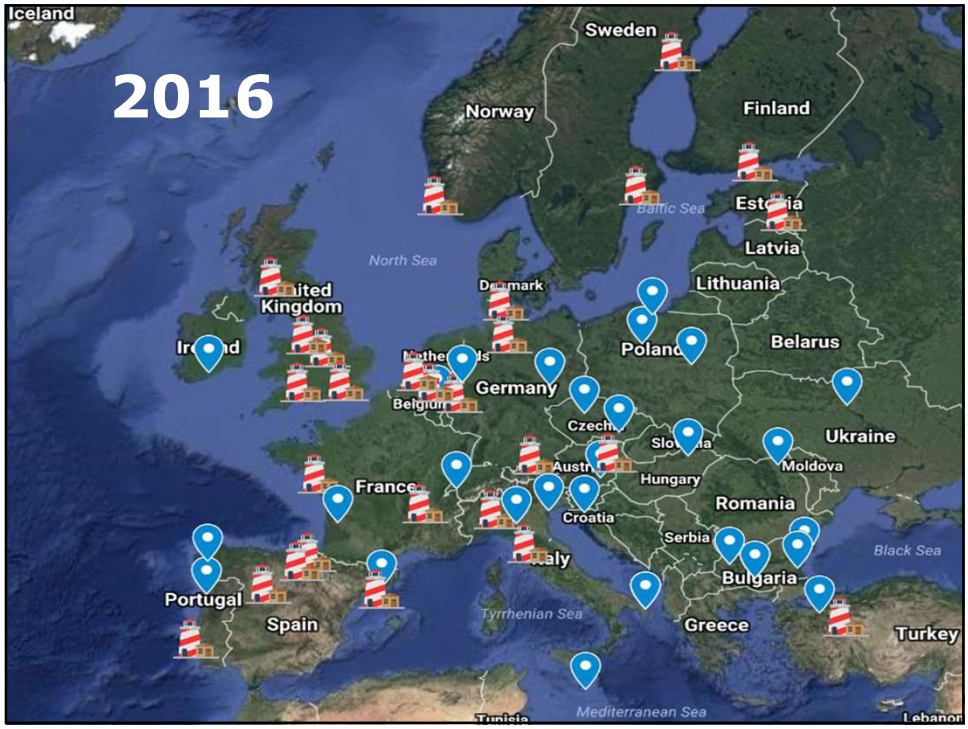
SCC

HORIZON 2020

European Commission


2014
Iceland
Sweden
Norway
Finland
Baltic Sea
Estonia
Latvia
North Sea
Denmark
Lithuania
United Kingdom
Belarus
Poland
Netherlands
Germany
Belgium
Czechia
Ukraine
Moldova
Hungary
France
Romania
Croatia
Serbia
Black Sea
Italy
Bulgaria
Portugal
Spain
Tyrrhenian Sea
Greece
Turkey
Mediterranean Sea


2015
Iceland
Sweden
Norway
Finland
Baltic Sea
Latvia
North Sea
Lithuania
United Kingdom
Belarus
Germany
Belgium
Czechia
Ukraine
Moldova
Hungary
France
Romania
Croatia
Serbia
Black Sea
Bulgaria
Portugal
Spain
Tyrrhenian Sea
Greece
Turkey
Mediterranean Sea


2016
Iceland
Sweden
Norway
Finland
Baltic Sea
Latvia
North Sea
Lithuania
Kingdom
Belarus
Germany
Ukraine
Moldova
Hungary
France
Romania
Croatia
Serbia
Black Sea
Bulgaria
Portugal
Spain
Tyrrhenian Sea
Greece
Turkey
Mediterranean Sea


2017
Iceland
Sweden
Norway
Finland
Baltic Sea
Latvia
North Sea
Lithuania
Kingdom
Belarus
Germany
Ukraine
Moldova
Hungary
France
Romania
Croatia
Serbia
Black Sea
Portugal
Spain
Tyrrhenian Sea
Greece
Turkey
Mediterranean Sea

2014

GROWSMARTER
Köln, Barcelona, Stockholm
& Graz, Cork, Valletta, Porto, Suceava

REMOURBAN
Valladolid, Tepebasi, Nottingham
& Seraing, Miskolc

TRIANGULUM
Eindhoven, Stavanger, Manchester
& Prague, Leipzig, Sabadell

2015

REPLICATE
San Sebastián/Donostia, Firenze, Bristol
& Lausanne, Essen, Nilufer

SHAR-LLM
Milano, Lisboa,London (Greenwich)
& Burgas, Bordeaux, Warsaw

SMARTENCITY
Sønderborg, Tartu, Vitoria/Gasteiz
& Asenovgrad, Lecce

SMARTER TOGETHER
Wien, München, Lyon
& Sofia, Santiago de Compostela, Venezia, Yokohama, Kiev

2016

mySMARTlife
Hamburg, Helsinki, Nantes
& Varna, Palencia, Rijeka, Bydgoszcz

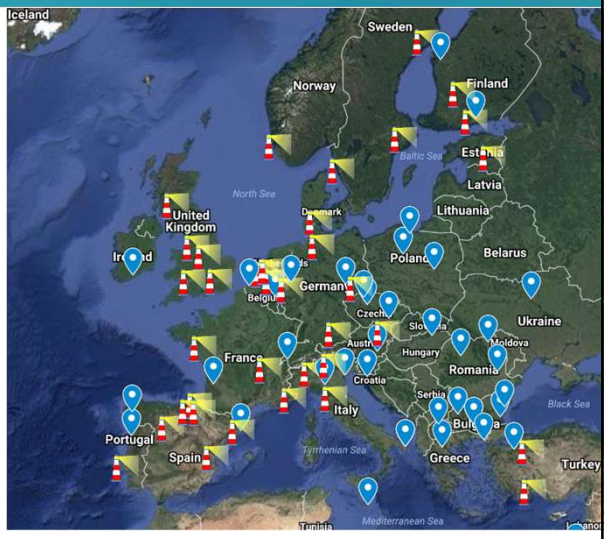
RUGGEDISED
Rotterdam, Ůmea, Glasgow
& Brno, Parma, Gdansk

2017

STARDUST
Pamplona, Tampere, Trento
& Cluj-Napoca, Derry, Kozani, Litoměřice

IRIS
Utrecht, Göteborg, Nice Côte d'Azur
& Vaasa, Alexandroupolis, Santa Cruz de Tenerife, Focsani

MatchUP
Valencia, Dresden, Antalya
& Ostend, Herzliya, Skopje, Kerava



European Commission

Smart Cities and Communities - SCC1

- **2018** is the **5th year of lighthouse projects** and the network is steadily growing.
- The **36 Lighthouse cities** and **42 Follower cities** are **working together** in the **lighthouse collaboration network**.
- They have **specific task groups** intensively working on **common topics** like:
  - **Replication**
  - **Business models**
  - **Dissemination**

Lighthouse cities and Follower cities

- Lighthouse Cities:
  - should act as **exemplars**
  - **help to plan and initiate** the replication of the deployed solutions in the Follower cities
  - Have to be bold and **try new innovative solutions**
  - get the larger part of the funds also because they bear the **first mover risk** for new solutions
- Follower Cities:
  - should **actively participate** from the first moment with the aim of **replication** of good solutions
- Lighthouse Cities and Follower Cities will **closely collaborate**

European Commission

Lighthouse projects

- Consortia shall be composed of **2 lighthouse cities** and **at least 5 follower cities**.
- **By the call deadline**, all lighthouse cities **must have a validated**: i) Sustainable Energy Action Plans (SEAP) or ii) Sustainable Energy (and Climate) Action Plans (SECAP) or iii) a similar, at least equally ambitious, plan.
- A city can be funded as a lighthouse city **only once** under Horizon 2020.

European Commission

Challenges

- Necessary **energy transition in cities**
- Increase **energy systems integration** and to push **energy performance levels** significantly
- Deploy and test integrated innovative solutions for **Positive Energy Blocks/Districts** in the Lighthouse Cities.
- Carry out extensive **performance monitoring** (ideally for more than **2 years**)
- **Interaction and integration** between the **buildings**, the **users** and the larger **energy system**.
- Implications of increased **electro-mobility**, its impact on the energy system and its integration in planning.

European Commission

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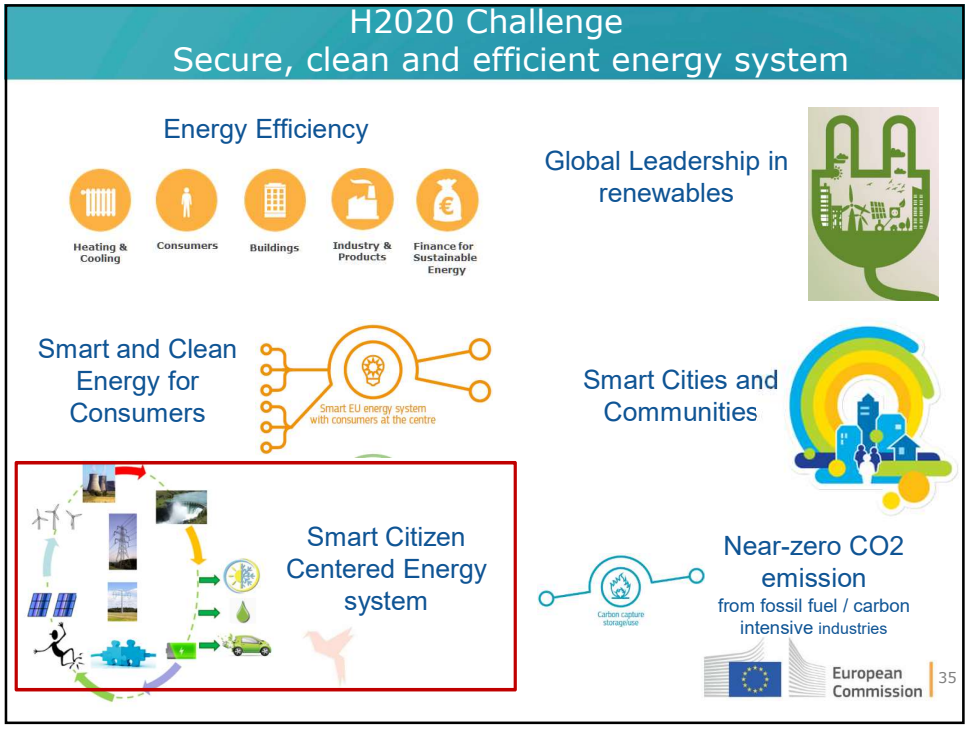
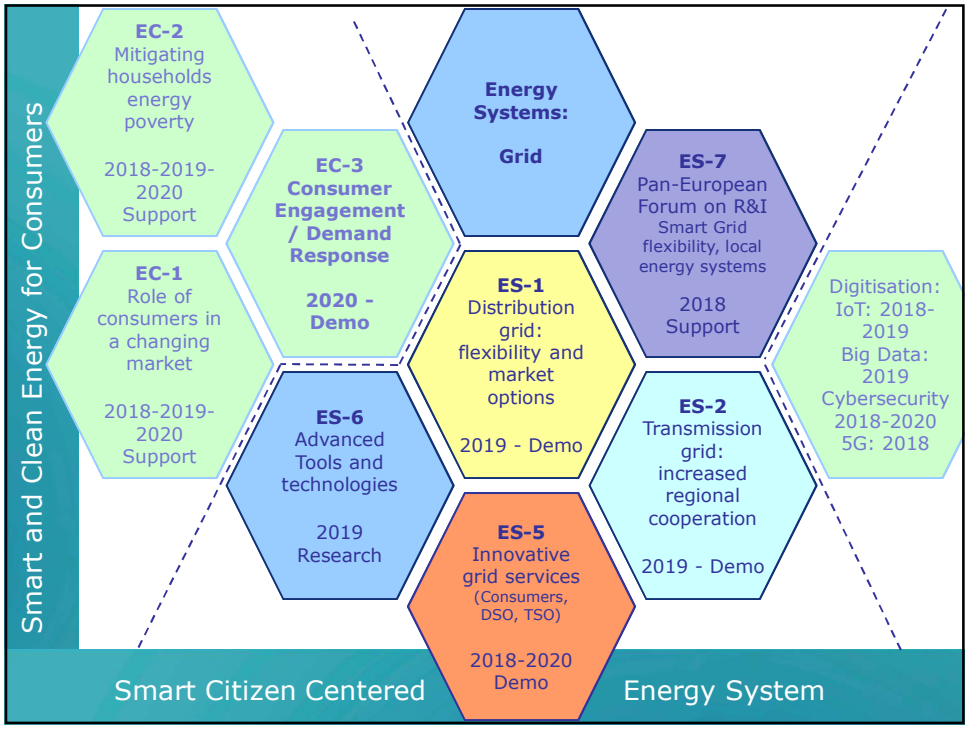
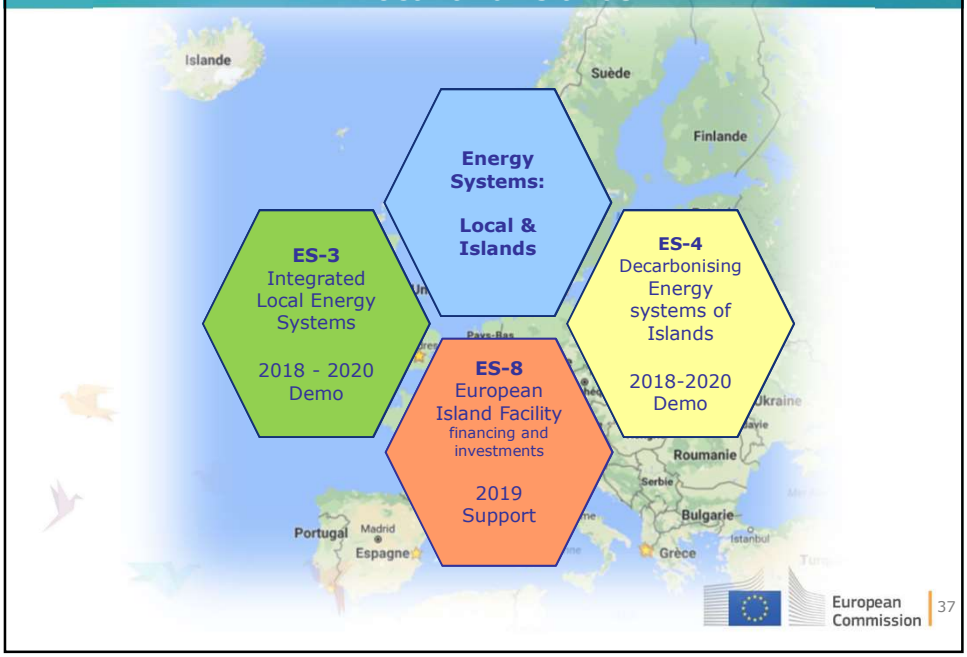
European Commission


H2020 Challenge
Secure, clean and efficient energy system
Energy Efficiency
Heating & Cooling
Consumers
Buildings
Industry & Products
Finance for Sustainable Energy
Global Leadership in renewables
Smart and Clean Energy for Consumers
Smart EU energy system with consumers at the centre
Smart Cities and Communities
Smart Citizen Centered Energy system
Carbon capture storage/use
Near-zero CO2 emission
from fossil fuel / carbon intensive industries
European Commission
35


Smart and Clean Energy for Consumers
EC-2 Mitigating households energy poverty
2018-2019-2020 Support
EC-1 Role of consumers in a changing market
2018-2019-2020 Support
EC-3 Consumer Engagement / Demand Response
2020 - Demo
Energy Systems: Grid
ES-1 Distribution grid: flexibility and market options
2019 - Demo
ES-6 Advanced Tools and technologies
2019 Research
ES-5 Innovative grid services (Consumers, DSO, TSO)
2018-2020 Demo
ES-7 Pan-European Forum on R&I Smart Grid flexibility, local energy systems
2018 Support
ES-2 Transmission grid: increased regional cooperation
2019 - Demo
Digitisation: IoT: 2018-2019 Big Data: 2019 Cybersecurity 2018-2020 5G: 2018
Smart Citizen Centered
Energy System

Smart Citizen Centered Energy System: Local and Islands



Overview of Topics

		Instrument	TRL	Ec. fund per Proj. MEur	2018 MEur	2019 MEur	2020
EC-3	Consumer Engagment						Open
ES-1	Distribution grid: flexibility and market	IA	5-8	6-8		37.3	
ES-2	Transmission grid: regional cooperation	IA	5-8	8-10		25	
ES-5	Innovative Grid services	IA	5-8	13-17	30		Open
ES-6	Advanced toosl and technologies	RIA	NA	2-4		25.4	
ES-3	Integrated local energy systems	IA	5-8	5-6	21		Open
ES-4	Decarbonising energy systems of islands	IA	5-8	7-10	19		Open
ES-8	European island facility	CSA	NA	10		10	
ES-7	Pan European	CSA	NA	3-4	3		
					73	97.7	

From vision and technology roadmap…

European Technology and Innovation Platform for Smart Networks for the Energy Transition

WG1 Reliable, economic and efficient smart grid system

WG2 Storage technologies and sector interfaces

WG3 Flexible Generation

WG4 Digitisation of the electricity system and customer participation

WG5 Innovation implementation in the business environment

NSCG National Stakeholders Coordination Group

… …to actual H2020 demo projects testing flexibility measures …

- Aggregated Electric heaters with storage
- Integrated Hybrid PV/thermal solar panels battery and thermal storage in homes
- 2nd-life battery packs with PV for buildings
- Shared batteries for energy communities (PV)

- Grid services
- Innovative smart grid technologies, enabling optimal and dynamic operation
- Integration of electric vehicles
- Near real time energy balancing market

RealValue · STORY · Elsa · SENSIBLE · InterFLEX · INVADE · wiseGRID · inteGRIDy · bridge HORIZON 2020 · integrid · GOFLEX

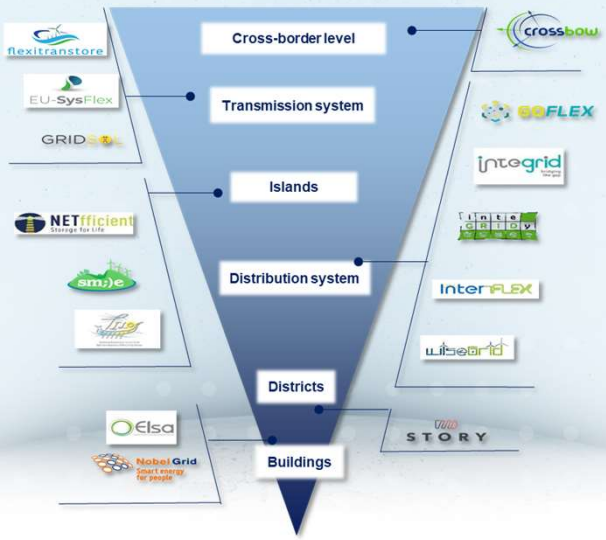
… from households level up to the transmission grid…

- Large scale storage testing (e.g. power to gas and solution for refrigerated warehouses)
- TSO – DSO Interactions on aggregation, grid services, handling of energy storage systems
- Cross-Border Cooperation between TSOs on management of RES production and sources of flexibility

bridge HORIZON 2020

Between 2014 and 2017, 420 MEur of Eu funding has been made available under H2020

… from cross-border level down to building level



bridge HORIZON 2020

Between 2014 and 2017, 420 MEur of EU funding has been made available under H2020

and a BRIDGE between project results and policy making has been established

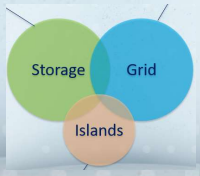
Data management

- Communication infrastructure
- Cybersecurity and data privacy
- Data handling
- Interoperability

Business Models

- Regulated activities
- Self-consumption
- Storage
- Demand Response

Regulations



Customer Engagement

- Understanding what customers value
- Segmenting Customers
- Engage End-Customers Early
- Co-design, social science together with technology

bridge HORIZON 2020

http://www.h2020-bridge.eu/

BRIDGE

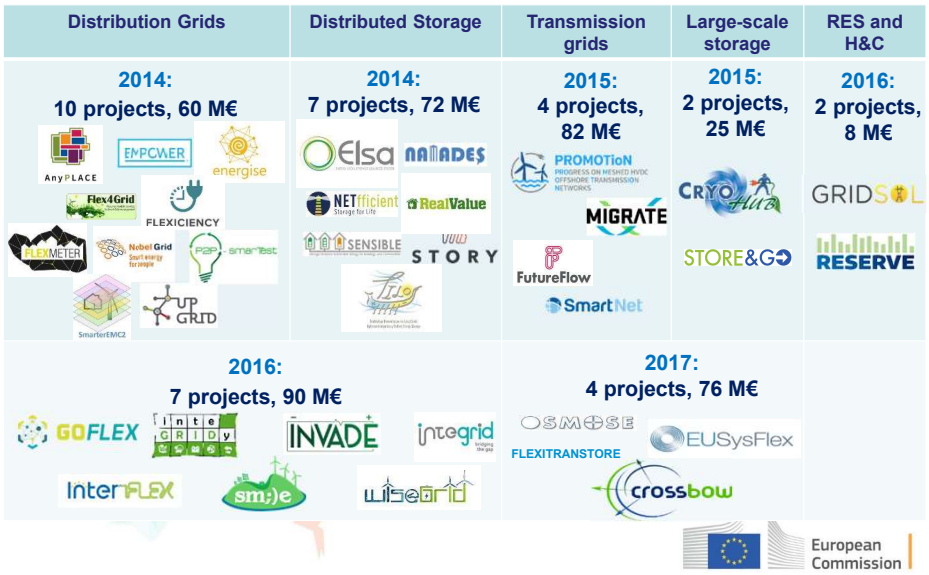
Accelerating smart grid and storage deployment by removing barriers to innovation

Bridging energy and digital economy

http://www.h2020-bridge.eu

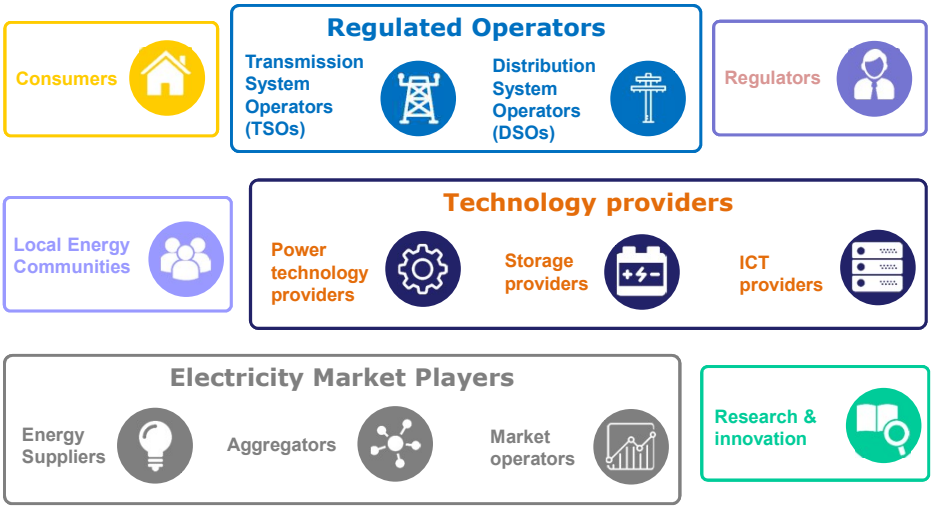
Twitter: @BRIDGE_H2020

BRIDGE projects overview



Stakeholders involved in BRIDGE projects

Innovation, data and smart grids



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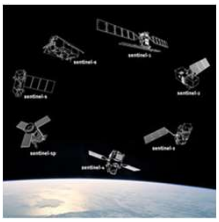
Cross-fertilization

- Think outside the box!
- EU flagship for environmental information
- 6 series of satellites & 6 services to deliver Earth observation data and environmental information products

→ **AVAILABLE** for the **ENERGY SECTOR**



- Access is full, free and open for H2020 projects !

www.copernicus.eu

Help and support at : http://copernicus.eu/cso in your language

European Commission

How Copernicus data can transform the energy sector

1. A business recognises the changing climate could impact their revenue, facilities or long term plans and want to know more.

2. They bring in an expert consultant to help them solve the problem, who recognises the need for data that can inform a business decision. The consultant knows about the Copernicus Climate Change Service and the Copernicus Atmosphere Monitoring Service which can provide both historic and predictive data across Europe.

3. The consultant accesses the Copernicus Climate Change Service and the Copernicus Atmosphere Monitoring Service's freely available data and tools to extract and visualise relevant information, tailoring and re-purposing it for the client's needs.

4. The consultant's analysis of the data and their modelling of potential scenarios enables companies to reduce risk and develop sustainable business plans.

5. The consultant's feedback helps the Copernicus Climate Change Service and the Copernicus Atmosphere Monitoring Service further develop climate indicators and tools for use by more businesses and sectors.

Copernicus can provide data and tools to ensure resilience, develop policy, protect health, unlock growth and understand the climate.

Source: https://climate.copernicus.eu

BRIDGE projects addressing storage and conversion
From the largest to the smallest scales

BRIDGE projects addressing Energy Storage and Conversion technologies can be grouped according to the scale they are targeting:

- **TRANSMISSION LEVEL**
  - Cross-border aspects
  - Interactions with distribution level
- **DISTRIBUTION LEVEL**
  - Large-scale storage
  - Grid services
  - From grid to building & household level
  - Island cases

bridge HORIZON 2020

BRIDGE projects addressing storage and conversion
From the largest to the smallest scales

TRANSMISSION LEVEL – Cross-border aspects

OSMOSE

Optimal System-Mix Of flexibility Solutions for European electricity

- **TSO-led project** to capture "silo-breaking" synergies across needs and sources of flexibilities
- **Multiple services** provided by **hybrid storage**

crossbow

CROSS BOrder management of variable renewable energies and storage units enabling a transnational Wholesale market

http://crossbowproject.eu/

- **TSO-led project** developing technological solutions to be deployed at transmission level to increase the **shared use of resources** to foster cross-border management of RES and storage

bridge HORIZON 2020

BRIDGE projects addressing storage and conversion
From the largest to the smallest scales

TRANSMISSION LEVEL – Interactions with distribution level

EU-SysFlex

Pan-European system with an efficient coordinated use of flexibilities for the integration of a large share of RES

www.eu-sysflex.com

- **TSO-led project** to demonstrate the **aggregation for multi-service provision** from a **portfolio of distributed resources**
- Pan-European Scalability and Replicability Analysis and Flexibility Roadmap

flexitranstore

An Integrated Platform for Increased FLEXIbility in smart TRANSmission grids with STORage Entities and large penetration of Renewable Energy Sources

www.flexitranstore.eu

- **TSO-led project** addressing **Battery Energy Storage Systems (BESS)** integration at **TSO/DSO border substations**, at **wind farms' substations** and at **synchronous gas turbines**

bridge HORIZON 2020

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BRIDGE projects addressing storage and conversion
From the largest to the smallest scales

DISTRIBUTION LEVEL – Large scale storage

STORE&GO

Innovative large-scale energy STOragE technologies AND Power-to-Gas concepts after Optimisation

http://www.storeandgo.info/

- **Power to Gas** (different methanation technologies)
- Plants of **200 kW to 1 MW**

CRYO HUB

Developing Cryogenic Energy Storage at Refrigerated Warehouses as an Interactive Hub to Integrate Renewable Energy in Industrial Food Refrigeration and to Enhance Power Grid Sustainability

http://www.cryohub.eu/

- **Cryogenic Energy Storage**
- Installed in **warehouses** and **food processing facilities**

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BRIDGE projects addressing storage and conversion
From the largest to the smallest scales

DISTRIBUTION LEVEL – Grid services (1/2)

GOFLEX

Generalized Operational FLEXibility for Integrating Renewables in the Distribution Grid

http://www.goflex-project.eu/

- Active use of distributed sources of flexibility to provide grid services and optimize energy consumption and production at the local level
- Storage technologies: **thermal** (heating/cooling) and **electric vehicles**

integrid

Demonstration of INTElligent grid technologies for renewables INTEgration and INTEractive consumer participation enabling INTEroperable market solutions and INTErconnected stakeholders

https://integrid-h2020.eu/

- Tools to enhance data exchange between market participants
- Flexibility offered by **electrical storage** at **utility** and **domestic scale** and **e-mobility**

InteGRIDy

integrated Smart GRID Cross-Functional Solutions for Optimized Synergetic Energy Distribution, Utilization & Storage Technologies

http://www.integridy.eu

- Deployment of novel strategies to manage energy storage systems (including **EV management**)
- **Self-consumption** and **ancillary services**

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BRIDGE projects addressing storage and conversion
From the largest to the smallest scales

DISTRIBUTION LEVEL – Grid services (2/2)

InterFLEX

Interactions between automated energy systems and Flexibilities brought by energy market players

http://interflex-h2020.com/

- Technologies include: **Energy storage**, **smart charging of electric vehicles**, demand response, islanding, grid automation and **integration of different energy carriers** (gas, heat, electricity)

INVADE

Smart system of renewable energy storage based on integrated EVs and batteries to empower mobile, distributed and centralised energy storage in the distribution grid

https://www.invadeh2020.eu/

- Cloud-based flexibility management system integrated with **EVs** and **batteries** empowering energy storage at **mobile**, **distributed** and **centralised levels**

wiseGRID

Wide scale demonstration of Integrated Solutions and business models for European smartGRID

http://www.wisegrid.eu

- Provides services empowering the prosumers and enabling the establishment of a **near real-time pan European energy balancing market**
- Storage technologies: **batteries** or **heat accumulators**

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BRIDGE projects addressing storage and conversion
From the largest to the smallest scales

DISTRIBUTION LEVEL – From grid to building & household level

SENSIBLE

Storage ENabled Sustainable energy for BuiLdings and communitiEs

www.h2020-project-sensible.eu/

- 3 demo sites involving **low-voltage networks**, **homes** and **larger buildings**
- Technologies: **Electro-chemical**, **electro-mechanical** and **thermal** storage

STORY

Added value of STORage in distribution sYstems

http://horizon2020-story.eu

- 8 demos ranging from **industrial area** and **urban district** to **residential buildings**
- Different storage technologies: **batteries**, **thermal** and **geothermal** storage…

Elsa

Energy Local Storage Advanced system

http://www.elsa-h2020.eu

- Integration of **second-life Li-ion batteries** at **building** level
- Development of a 'storage-as-a-service system' and interoperable ICT platform

RealValue

Realising Value from Electricity Markets with Local Smart Electric Thermal Storage Technology

http://www.realvalueproject.com/

- **Smart Electric Thermal Storage** Systems (SETS) installed at **household** level and other buildings
- Provision of energy, capacity and system services

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BRIDGE projects addressing storage and conversion
From the largest to the smallest scales

DISTRIBUTION LEVEL – Island cases

TILOS

Technology Innovation for the Local Scale, Optimum Integration of Battery Energy Storage

http://www.tiloshorizon.eu/

- Development and operation of a **prototype battery storage system** that will be provided with a smart grid control systems

NETfficient

Energy and economic efficiency for today's smart communities through integrated multi storage technologies

http://netfficient-project.eu/

- Technical solutions to enable the integration of storage technologies: **batteries** including **second life batteries from EVs**, **fuel cells**, etc.

sm;)e

SMart IsLand Energy systems

http://www.h2020smile.eu/

- Storage technologies available on islands: **batteries** (inc. from **EVs** and **boats**), **Power to Heat**…

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04 – 08 JUNE 2018

EU SUSTAINABLE ENERGY WEEK

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European Commission

Thank You for Your Attention!

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