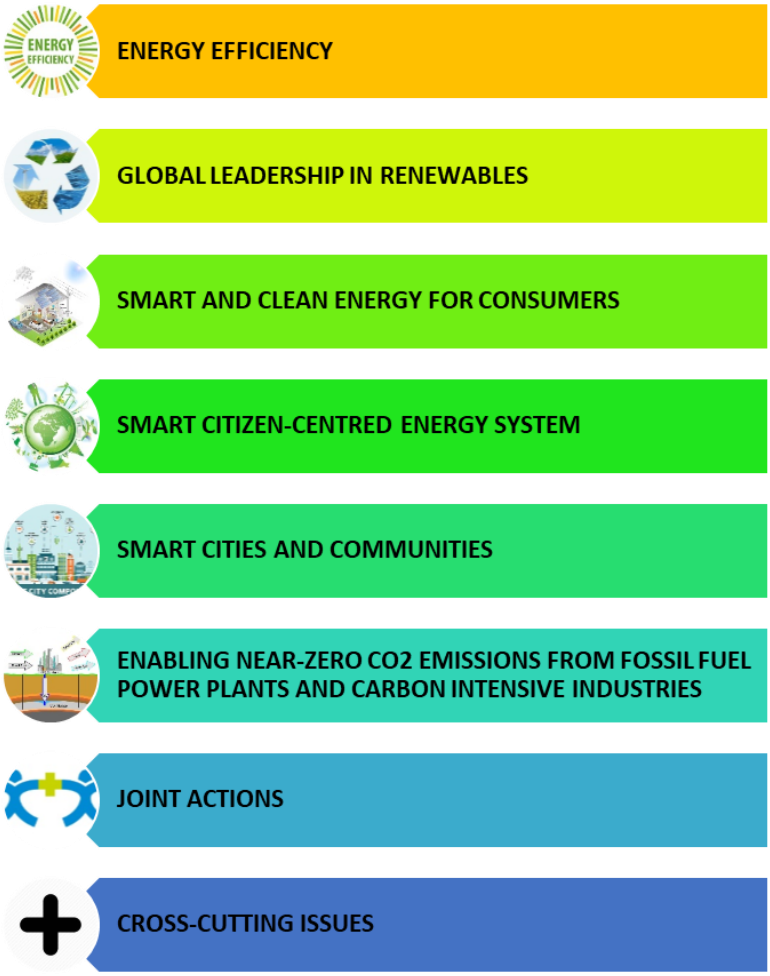
SC3 - Secure, clean and efficient energy

The 2018-2020 Work Programme of the Societal Challenge 3 consists of one main call for proposals titled: **"Building a low-carbon, climate resilient future: secure, clean and efficient energy"**, with an overall estimated budget over the three years equal to **1,77 Billion Euro**.
In order to reach the goals of the Paris Agreement, the "Clean Energy for all European" package, and the Strategic Energy Technology (SET)-Plan priorities, a series of Research and Innovation activities supported in this call should deliver: on the supply side, **cheaper and more performant generation technologies**; a **smarter, more flexible and resilient energy system**; on the demand side, **increased overall energy efficiency**; a **better understanding of the specific socio-economic contexts; increased market-uptake of innovations**, including the implementation of **energy policy**, the preparation for **rolling-out investments**, and the support for **capacity-building**.
The topics of SC3 are grouped within the following 8 thematic areas:



In 2019 a new Work Programme part, titled "Cross-cutting activities", has been released. It contains the call "Building a Low-Carbon, Climate Resilient Future: **Next-Generation Batteries**". The seven topics, all with deadline 25 April 2019, can be found here. The summary of the call can be found on page 6.

ENERGY EFFICIENCY

Energy efficiency needs to be considered as a source of energy in its own right. An ambitious approach to energy efficiency is needed across all the sectors, but the major challenge of the next decade – in line with the ACEI priority to decarbonise the EU building stock by 2050 – lies in ***buildings****.*
Digital smart technologies *will be playing an increasingly important role. In this framework, this call supports both technology and business development and test it in real market & regulatory conditions to pave the way towards the uptake of innovative energy services enabled by energy decarbonisation, decentralisation and digitalisation.*
Innovation is however also needed in the ***financing of energy efficiency*** *where innovative financing schemes and approaches can help bridge the gap between project development and financing.*

Upgrading buildings' energy performance and smartness			
Action	**Topic**	**Opening date**	**Deadline(s)**
IA	Decarbonisation of the EU building stock: innovative approaches and affordable solutions changing the market for buildings renovation	12/03/2019	03/09/2019
CSA	Integrated home renovation services	12/03/2019	03/09/2019
CSA	Stimulating demand for sustainable energy skills in the construction sector	12/03/2019	03/09/2019
IA	Upgrading smartness of existing buildings through innovations for legacy equipment	12/03/2019	03/09/2019
IA	Next-generation of Energy Performance Assessment and Certification	12/03/2019	03/09/2019
Energy efficient industry and services			
Action	**Topic**	**Opening date**	**Deadline(s)**
CSA	Business case for industrial waste heat/cold recovery: *Symbiosis in industrial parks and clusters- non-technological barriers*	12/03/2019	03/09/2019
CSA	Capacity building programmes to support implementation of energy audits	12/03/2019	03/09/2019
Energy efficiency is an investment			
Action	**Topic**	**Opening date**	**Deadline(s)**
CSA	Innovative financing for energy efficiency investments	12/03/2019	03/09/2019
	Mainstreaming energy efficiency finance	12/03/2019	03/09/2019
	Aggregation - Project Development Assistance	12/03/2019	03/09/2019
Energy efficiency is an energy source			
Action	**Topic**	**Opening date**	**Deadline(s)**
IA	Enabling next-generation of smart energy services valorising energy efficiency and flexibility at demand-side as energy resource	12/03/2019	03/09/2019
RIA	Socio-economic research conceptualising and modelling energy efficiency and energy demand: *substantiate the demand side aspects in energy modelling*	12/03/2019	03/09/2019
Support for policy-driven innovations			
Action	**Topic**	**Opening date**	**Deadline(s)**
CSA	Supporting public authorities to implement the Energy Union	12/03/2019	03/09/2019
	European City Facility - European Cities as key innovation hubs to unlock finance for energy efficiency	01/08/2018	05/02/2019
	Bioclimatic approaches for improving energy performance in buildings in Africa and Europe	12/03/2019	03/09/2019

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GLOBAL LEADERSHIP IN RENEWABLES

Actions in this area aim to produce solutions to support the worldwide large-scale deployment of renewable energy, its broader penetration in the energy and transport mix to significantly contribute to the decarbonisation of the global economy of the future. Actions will make ***renewable energy solutions cost competitive*** *with their fossil equivalents, allowing them to participate in the energy and transport markets. They will support the* ***transition to a decentralized energy system*** *where the citizens are empowered to take an active role and become prosumers. In addition to the Energy Union strategy, actions will contribute to the broader EU policies and objectives of growth and jobs, promoting* ***production of more affordable energy*** *in Europe and sustaining European players to succeed in the global energy and transport markets, giving special consideration to* ***cooperation with strategic partner countries/regions****.*

Next Renewables energy solutions			
Action	**Topic**	**Opening date**	**Deadline(s)**
RIA	Developing the next generation of renewable energy technologies	01/08/2018	16/10/2018 25/04/2019
	Converting Sunlight to storable chemical energy	07/05/2019	27/08/2019
Renewable energy solutions for implementation at consumer scale			
Action	**Topic**	**Opening date**	**Deadline(s)**
RIA	Solar Energy in Industrial Processes	07/05/2019	27/08/2019
IA	Combining Renewable Technologies for a Renewable District Heating and/or Cooling System	05/09/2018	11/12/2018
Renewable energy solutions for energy system level implementation			
Action	**Topic**	**Opening date**	**Deadline(s)**
RIA	Optimising manufacturing and system operation	01/08/2018	16/10/2018 25/04/2019
IA	Increase the competitiveness of the EU PV manufacturing industry	05/09/2018	11/12/2018
RIA	Development of solutions based on renewable sources that provide flexibility to the energy system	07/05/2019	27/08/2019
IA	Demonstration of solutions based on renewable sources that provide flexibility to the energy system	05/09/2018	11/12/2018
IA	Demonstration of plug and play solutions for renewable off-grid electricity	05/09/2018	11/12/2018
Renewable Fuels for transport			
Action	**Topic**	**Opening date**	**Deadline(s)**
RIA	Development of next generation biofuel and alternative renewable fuel technologies for aviation and shipping	07/05/2019	27/08/2019
IA	Boosting pre-commercial production of advanced aviation biofuels	05/09/2018	11/12/2018
Market Uptake Support			
Action	**Topic**	**Opening date**	**Deadline(s)**
CSA	Market Uptake support	05/09/2018	11/12/2018

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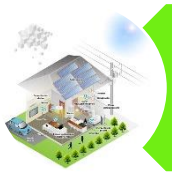

SMART AND CLEAN ENERGY FOR CONSUMERS

*The Clean Energy for all Europeans package places **consumers firmly at the centre of the energy transition**, with consumers considered as active market players in the energy system. The future consumer should be **better informed** and **more aware**, and have an **increased capacity to fully engage in energy markets**.*
*Although the energy transition is expected to lead to a number of benefits for consumers, **energy poverty** continues to affect the quality of life of a significant number of European citizens. In combination with financial interventions and building retrofitting, low-cost measures at the household level and use of renewable energy are key solutions in alleviating energy poverty. We should also test today what are the **right incentives that can be put in place** so as to reward consumers when playing a role in increasing the share of variable renewables in the electricity mix.*

Action	Topic	Opening date	Deadline(s)
CSA	The role of consumers in changing the market through informed decision and collective actions	12/03/2019	03/09/2019
	Mitigating household energy poverty	12/03/2019	03/09/2019

SMART CITIZEN-CENTRED ENERGY SYSTEM

*A first group of topics is expected to **increase the capacity of the European electricity grid to host a larger share of variable renewables** so as to accelerate its decarbonisation. For this purpose, stronger engagement of consumers is needed, more flexibility services for both distribution and the transmission grids, higher levels of regional cooperation at transmission levels and well-functioning retail and wholesale markets that are capable of financing necessary investments. A second group of topics is expected to **impact on the decarbonisation of energy systems on geographical islands and at local levels on the mainland** taking advantage of the availability of local renewables resources, the specificity of the demand and of the local energy networks to design and demonstrate low carbon local energy system.*

Action	Topic	Opening date	Deadline(s)
IA	Flexibility and retail market options for the distribution grid	05/09/2018	05/02/2019
IA	Solutions for increased regional cross-border cooperation in the transmission grid	05/09/2018	05/02/2019
RIA	Research on advanced tools and technological development	05/09/2018	05/02/2019
CSA	European Islands Facility - Unlock financing for energy transitions and supporting islands to develop investment concepts	05/09/2018	05/02/2019
ERA-NET COFUND	ERA-NET Co-Fund Enhanced cooperation in Digitalisation of Energy Systems and Networks	14/11/2018	27/08/2019

SMART CITIES AND COMMUNITIES

*To achieve the necessary energy transition in cities, it is essential to **increase energy systems integration** and to **push energy performance levels** significantly beyond the levels of current EU building codes and to realize Europe wide deployment of Positive Energy Districts by 2050.*

Action	Topic	Opening date	Deadline(s)
IA	Smart Cities and Communities	05/09/2018	05/02/2019

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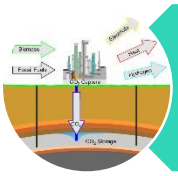

ENABLING NEAR-ZERO CO2 EMISSIONS FROM FOSSIL FUEL POWER PLANTS AND CARBON INTENSIVE INDUSTRIES

Carbon Capture & Storage (CCS) is one of the key promising technologies that can reduce CO2 emissions in the power generation sector. In order to realise its potential, ***CCS needs to become a cost-competitive technology*** *and* ***prove its safety****. Key challenges are the demonstration of the full CCS chain, the reduction of the energy penalty and cost of capture, the detailed appraisal of cost-effective storage capacity in selected regions, and establishing the necessary infrastructure for CO2 transport. New solutions for* ***the conversion of captured CO2*** *(Carbon Capture & Utilisation – CCU)* ***to useful products*** *such as fuels or chemicals* ***will create new markets for innovative industrial sectors****.*

Action	Topic	Opening date	Deadline(s)
IA	Integrated solutions for flexible operation of fossil fuel power plants through power-to-X-to-power and/or energy storage	07/05/2019	27/08/2019
IA	Low carbon industrial production using CCUS	07/05/2019	27/08/2019

JOINT ACTIONS

The objective of topics included in this area is to facilitate the ***creation or continuation of energy R&I public partnerships*** *between the European Commission and/or countries and regions in Europe and beyond.*

Action	Topic	Opening date	Deadline(s)
CSA	Support to the realisation of the Implementation Plans of the SET Plan	14/11/2018	27/08/2019
PCP	European Pre-Commercial Procurement Programme for Wave Energy Research & Development	14/11/2018	27/08/2019

CROSS-CUTTING ISSUES

The objective of topics included in this area is to facilitate the ***creation or continuation of energy R&I public partnerships*** *between the European Commission and/or countries and regions in Europe and beyond.*

Action	Topic	Opening date	Deadline(s)
RIA	Social Sciences and Humanities (SSH) aspects of the Clean-Energy Transition: *Challenges facing carbon-intensive regions*	07/05/2019	27/08/2019
CSA	Support for the opening of low-carbon energy research databases in Europe	14/11/2018	27/08/2019

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Call: Building a Low-Carbon, Climate Resilient Future: Next-Generation Batteries

Electric batteries are currently seen as important technological enablers to drive the transition towards a de-carbonised society, by integration of renewable and clean energy sources (such as wind energy and photovoltaics) in the electricity grid, and, in particular, by electrification of transport. Energy storage is the common denominator: it includes both **electro-mobility** and **stationary applications** despite the different constraints applying to each of these applications in real life. Electric batteries have recently achieved considerable improvements in terms of their technical performance (such as energy density, power density, thermal stability and durability) and economic affordability. Such improvements are major contributors to the successful introduction of electric vehicles (which are becoming cheaper and have longer range) and of stationary energy storage systems. But for a successful mass introduction of electrified mobility and renewable and clean energy systems with market competitive performances and - in the case of electric vehicles - fast charging capability, substantial improvements of the electric battery technologies are required.

Currently, the world production of automotive battery cells is dominated by Asian companies which represent more than 90% of the present world capacity. It will be very challenging for European companies to catch-up. Europe has to search for better performance, and strongly force the development of more price competitive and sustainable battery storage solutions. Beyond research on **improved electrochemistry** and **new battery materials** (e.g. advanced Li-ion, solid-state and post-Li-ion technologies), it is the **complete electric batteries value chain and life-cycle** that has to be considered, from access to raw material, over innovative advanced materials and nanotechnologies to modelling, production, recycling, second life, life cycle and environmental assessment and skills.

In 2019, proposals are invited to the following topics:

Action	Topic	Opening date	Deadline(s)
RIA	Strongly improved, highly performant and safe all solid state batteries for electric vehicles	24/01/2019	25/04/2019
RIA	Strengthening EU materials technologies for non-automotive battery storage	24/01/2019	25/04/2019
RIA	Modelling and simulation for Redox Flow Battery development	24/01/2019	25/04/2019
RIA	Advanced Redox Flow Batteries for stationary energy storage	24/01/2019	25/04/2019
RIA	Research and innovation for advanced Li-ion cells (generation 3b)	24/01/2019	25/04/2019
RIA	Li-ion Cell Materials & Transport Modelling	24/01/2019	25/04/2019
CSA	Network of Li-ion cell pilot lines	24/01/2019	25/04/2019

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Other opportunities for Energy research and innovation across Horizon 2020

Specific topics in other parts of H2020	• LEIT ICT: Interoperable and smart homes and grids • LEIT ICT: Big data solutions for energy
Bottom-up activities	• European Research Council • European Innovation Council (SME Instrument, Fast-Track-to- Innovation, FET, Prizes) • Marie Sklodowska-Curie Actions
H2020 Inducement Prizes	• Horizon prize for CO2 reuse • Horizon prize for Combined heat and power installation in a hospital using 100% renewable energy sources • Horizon prize for Integrated Photovoltaic System in European Protected Historic Urban districts • Horizon prize for Fuel from the Sun: Artificial Photosynthesis
Societal Challenges and LEIT	• 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 • LEIT: Materials • LEIT: PPPs on Energy-efficient Buildings and SPIRE • LEIT: Information and Communication Technologies • LEIT: Space (GALILEO)

The policy context

GLOBAL COMMITTMENTS:

http://www.un.org/sustainabledevelopment/sustainable-development-goals/

https://ec.europa.eu/clima/policies/international/negotiations/paris_en#tab-0-0

http://unfccc.int/paris_agreement/items/9485.php

http://mission-innovation.net/

EUROPEAN POLICIES:

Energy Union
https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union

Clean Energy for All Europeans
https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/clean-energy-all-europeans

Accelerating Clean Energy Innovation
https://ec.europa.eu/energy/sites/ener/files/documents/1_en_act_part1_v6_0.pdf

Strategic Energy Technology (SET) Plans
https://ec.europa.eu/energy/en/topics/technology-and-innovation/strategic-energy-technology-plan

Circular economy
http://ec.europa.eu/environment/circular-economy/index_en.htm

Digital single market
https://ec.europa.eu/digital-single-market/