



HORIZON EUROPE

THE EU RESEARCH & INNOVATION PROGRAMME

2021 – 2027

Horizon Europe Cluster 5 Info Day
3 February 2022





EUROPEAN UNION

CLUSTER 5 Climate, Energy & Mobility

INFO DAY 2022 - 3 February 2022

WELCOME

Ask your questions on Sli.do - #CL5INFODAY22

THE EU RESEARCH & INNOVATION PROGRAMME 2021 - 2027

CLUSTER 5 Climate, Energy, Mobility



Virtual INFO DAY 2022
3 February 2022

Parallel sessions – 14:00 – 15:15

Destination 3

Carbon capture, utilisation and storage; Energy systems, grids and storage

Follow the streaming link: <https://europa.eu/!UmC7FF>

Destination 3

Global leadership in renewable energy

Follow the streaming link: <https://europa.eu/!UmC7FF>



Destination 5

Impact of transport on environment and human health; Waterborne transport

Follow the streaming link: <https://europa.eu/!UmC7FF>

How to... Slido!



During the event, you can use Slido to submit your questions and comments

1. Take out your smartphone, tablet or computer and open your browser

2. Go to *Slido.com* and enter

the event code `#CL5INFODAY22`

3. Ask your question or vote for an existing one





CLUSTER 5

CLIMATE



ENERGY



MOBILITY



HORIZON EUROPE

INFO DAYS 2021



DECARBONISING INDUSTRY WITH CCUS

HORIZON-CL5-2022-D3-01-15

Dr. Vassilios KOUGIONAS

**Policy Officer, DG Research and Innovation,
Unit: Clean Energy Transition**

2021 – 2027

Carbon capture, utilisation and storage (CCUS)

- **CCUS will play crucial role in Horizon Europe/EU Green Deal in particular for the transition of energy-intensive industries and the power sector towards climate neutrality**
- **Particularly important in those industries where other alternatives do not yet exist**
- **If CCUS combined with sustainable biomass, it could create negative emissions**
- **Low carbon hydrogen from natural gas with CCUS in transitional phase towards H2 from renewable sources**
- **CCUS for industrial clusters**
- **Demonstration of the full CCUS chain**
- **Conversion of captured CO2 to useful products**

Expected Impacts for CCUS Topics

- Accelerated rollout of infrastructure for CCUS hubs and clusters
- Connecting industrial CO₂ sources with potential 'bankable' storage sites → greater confidence for decision makers and investors
- Proven feasibility of integrating CO₂ capture, CO₂ storage and CO₂ use in industrial facilities
- Reducing cost of CCUS value chain, in particular carbon capture
- Ensure adequate frameworks for Measurement, Monitoring and Verification of storage projects
- Document the safety of CO₂ storage in view of public acceptance
- Synergies exist with Cluster 4 on the use of CO₂

HORIZON-CL5-2022-D3-01-15

Decarbonising industry with CCUS



Scope (1)

- The focus of this topic lies in demonstrating the integrated chain of mature CO₂ capture technologies in industrial facilities with the perspective of geological storage and/or use.
- Relevant industrial sectors in which inclusion of CCUS could contribute to reaching climate neutrality are for example steel, iron and cement making, oil refining, gas processing, hydrogen production, sustainable biofuel production and waste-to-energy plants
- Important aspects to address are of technical (e.g. the optimised integration of capture plant with industrial processes; flexibility, scalability; CO₂ purity), safety (during transport and storage), financial (e.g. cost of capture; cost of integration) and strategic nature (e.g. business models; operation and logistics of industrial clusters and networks).

HORIZON-CL5-2022-D3-01-15

Decarbonising industry with CCUS



Scope (2)

- Based on a high TRL (7 – 8) CO₂ capture project a detailed plan on how to use the result, the subsequent transport, utilisation and/or underground storage of the captured CO₂ should be developed.
- The project should identify a detailed set of operational, environmental, technical and economic Key Performance Indicators (KPIs) to allow monitoring and assessing the progress achieved by the project.
- The project shall include an assessment of the societal readiness towards the proposed innovations, by identifying and involving relevant end users and societal stakeholders.

HORIZON-CL5-2022-D3-01-15

Decarbonising industry with CCUS



Expected outcome

- **Successful, safe and economic demonstration of integrated-chain CCUS from relevant industrial sources will pave the way for subsequent first-of-a-kind industrial projects.**
- **The scale of the proposals should permit obtaining relevant data and experience required so that up-scaling to a first-of-a-kind plant can be envisaged as a next step.**
- **The impact of projects will be determined by the extent to which the results will be used in further industrial facilities.**
- **It is important to demonstrate how the captured CO₂ will be utilised and/or stored in a sustainable way.**
- **Projects carried out in areas with a sufficient concentration of CO₂ emitting industries are considered prime sites for hub and cluster developments, and are expected to generate the highest impact on full-scale deployment of the results.**

HORIZON-CL5-2022-D3-01-15

Decarbonising industry with CCUS



Type of action:

- **Innovation Action**
- **Activities are expected to achieve TRL 7-8 by the end of the project**



EU contribution

- **Total indicative budget for the topic 58 Mio €**
- **Estimated contribution per project up to 29 Mio €**
- **Funding Rate up to 70 % of total eligible costs**



Deadline:

- **Deadline 26 April 2022**

HORIZON-CL5-2022-D3-01-08

Supporting the action of consumers in the energy market and guide them to act as prosumers, communities and other active forms of active participation in the energy activities

Expected outcome



Demonstrate in real life interactive communication and support tools to engage citizens in the energy transition and to support them throughout the process of creating, constituting and developing an energy community, that are developed and fine-tuned based on field-tests;

- Engagement of distributed active consumers and energy communities at broad scale, including through innovative incentive mechanisms;
- Enabled new market roles and market participants; enabled automated participation;
- Residential and SME related Demand Response contributing to increased level of flexibility and to the development of new flexibility products;
- Identified drivers and rules beyond marginal pricing which can steer the transactions within the energy communities;
- Developing mechanisms to support the creation, growth and capacity building of energy communities

HORIZON-CL5-2022-D3-01-08

Supporting the action of consumers in the energy market and guide them to act as prosumers, communities and other active forms of active participation in the energy activities



Scope

Innovative tools and tailored solutions should be developed and tested in order to fully enable new type of interactions between citizens as consumers, prosumers and (members of) energy communities and foster participation in energy (in particular electricity) markets, as per provisions in the Clean Energy Package;

- Projects should link citizens, technologies, regulation and markets together
- Tools should be developed to support demonstration of the energy community paradigm shift within the CEP using suitable digital platforms for putting citizens in direct contact with each other and other market stakeholders and to increase prosumers' participation and satisfaction;
- Dedicated demonstration should be set to demonstrate the use of these interactive tools to contribute to **real time optimization of Distributed Energy Resources** and the **facilitation of investment decision** at household level or community level, in RES or demand response;
- **SSH approach** to build the demonstrators so to understand the consumer's behavior and create innovative tools and tailored solutions to empower prosumers

HORIZON-CL5-2022-D3-01-08

Supporting the action of consumers in the energy market and guide them to act as prosumers, communities and other active forms of active participation in the energy activities



Type of Action: Innovation Action



EU contribution: EUR 18 million (5 – 6 million per project)



Deadline: 26 April 2022

HORIZON-CL5-2022-D3-01-09

Real Time Demonstrator of Multi-Vendor Multi-Terminal VSC-HVDC with Grid Forming Capability (in support of the offshore strategy)



Expected outcome

Conditions and methodologies are available for integrating seamlessly Multi-Terminal HVDC converter stations from different manufacturers, starting from this demonstrator onwards in the electricity grid (i.e. interfacing issues among different manufacturers' converters eliminated). Contextually, the demonstrator addresses the loss of inertia due to the growing penetration of Power Electronic Interfaced Generation (RES: PV, wind) using Grid Forming Capability.

- Solid foundation to ensure investments in HVDC and DC technologies for the European electricity network needed for the off-shore (and on-shore) development and for the energy transition.
- Advanced grid management capabilities (active and reactive power controlled separately, support to weak AC grids, black start, etc.)
- New way of framing the European energy system (on- off-shore) architecture and topology.
- Increased involvement, knowledge and confidence of all stakeholders (HVDC system manufacturers, TSOs, third-party system integrators, wind turbine manufacturers, offshore wind farm developers) in HVDC & DC Technologies

HORIZON-CL5-2022-D3-01-09

Real Time Demonstrator of Multi-Vendor Multi-Terminal VSC-HVDC with Grid Forming Capability (in support of the offshore strategy)



Scope

All the activities necessary for the implementation of a Real Time Demonstrator Multi-Vendor Multi-Terminal HVDC (Voltage Source Converter High Voltage Direct Current) with Grid Forming capability.

- Definition of basic and detailed functional specifications (control and protection interoperability, readiness for future seamless system extension, standardisation of HVDC models and replicas, model for interoperability assessment of grid forming converters, etc.).
- Real-time physical demonstrator of a HVDC system connected to the AC grid with at least three terminals of three different manufacturers with power rating applicable in the current existing real life use cases.
- Development, integration, testing and validation of HV components and sub-systems guaranteeing interoperability. Evaluation of the technological challenges related to placing MT-HVDC systems subsea, e.g. at the sea bottom.
- Grid codes, standardisation, regulatory framework

HORIZON-CL5-2022-D3-01-09

Real Time Demonstrator of Multi-Vendor Multi-Terminal VSC-HVDC with Grid Forming Capability (in support of the offshore strategy)



Type of Action: Innovation Actions



EU contribution: EUR 55 million



Deadline: 26 April 2022

HORIZON-CL5-2022-D3-01-10

Interoperable solutions for flexibility services using distributed energy storage



Expected outcome

- A **new generation of energy management systems** implemented to provide the capability of a hybrid energy storage systems (HESS) to work as a conventional battery energy storage system with enhanced performance.
- Agreement in wide scope of stakeholders including EV community and other sources of storage (e.g. flexible heat pumps) on a **common protocol that could connect different storage applications**.
- **Validation of user acceptance, the ease of use and interoperability**

HORIZON-CL5-2022-D3-01-10

Interoperable solutions for flexibility services using distributed energy storage



Scope: Pilots need to demonstrate innovative Hybrid Energy Storage Systems (HESS) solutions including real-time data sharing and operation - within the home, building, community and (grid-connected) stand-alone context. HESS should, among other, cover different types of battery energy storage systems, including EVs, while ideally covering also other storage types e.g. in the context of the use of heat pumps.

- **Real-time data sharing and operation should be ensured through aligning existing standards from the utility and ICT domains**, across the devices and systems. **Pending amendments to Renewable energy directive to be taken into account** (cf real-time access to the data of the battery management systems: new Article 20a)
- **Deployment and adoption of IoT standards and platforms for distributed storage systems** (stationary and electric vehicles)
- **Common solution between different brands** of different storage devices should be looked at
- **Highest (semantic) interoperability should be reached** for all use cases of storage and cost of deployment of distributed storage is decreased.
- Common architecture models (SGAM) and implementing standards (such as CEN-CENELEC SAREF etc.) should be taken into account

HORIZON-CL5-2022-D3-01-10

Interoperable solutions for flexibility services using distributed energy storage



Type of action: Innovation Action



EU contribution: EUR 7.00 million (EUR 2-3 million per project)



Deadline: 26 April 2022

HORIZON-CL5-2022-D3-01-11

Demonstration of innovative forms of storage and their successful operation and integration into innovative energy systems and grid architectures



Scope

Demonstration of successful operation and integration of either standalone or combined innovative storage solutions (e.g. chemical, electrical, thermal, mechanical including e.g. compressed air/liquid, supercapacitors, innovative hydropower storage solutions) into innovative energy systems and grid architectures. ...Solutions should in particular ... drive further the successful penetration of renewable ... across several important demand sectors ... interface of renewable energies and specific demand sector needs.

The solutions should show clear innovation ... advanced materials ... sustainability and circular economy...respond to energy storage flexibility requirements in form of technological requirements ...

The demonstrated technologies should include interfaces for connecting with existing infrastructure ...ensure interoperability and compatibility.

Highest interoperability ...Technical and regulatory barriers ...consumer acceptance

The selected projects are expected to contribute to relevant BRIDGE¹ activities.

HORIZON-CL5-2022-D3-01-11

Demonstration of innovative forms of storage and their successful operation and integration into innovative energy systems and grid architectures



Expected outcome

Project results are expected to contribute to most of the following expected outcomes:

- Demonstration of innovative storage technologies ...
- Increased availability, robustness and safety of sustainable and efficient choices for energy storage...
- Demonstrated availability and functionality of innovative energy storage systems developed for specific system designs and applications.
- Improvement of the already established European storage value chain able to contribute to the EU climate neutrality objectives.
- Creation and improvement of European technological value chains with the potential for international cooperation and market exploration
- Demonstration of successful business cases and systems designs ...
- Demonstration of effective integration of innovative energy storage systems and value chains...
- Ensuring the compatibility of systems ...

HORIZON-CL5-2022-D3-01-11

Demonstration of innovative forms of storage and their successful operation and integration into innovative energy systems and grid architectures



Type of action: Innovation Actions

Activities are expected to achieve TRL 6-7 by the end of the project



EU contribution: between EUR 7.00 and 8.00 million (total: EUR 30.00 million)



Deadline: 26 April 2022

HORIZON-CL5-2022-D3-01-12

Replicable solutions for a cross sector compliant energy ecosystem



Scope

- Adoption and usage of **connected interoperable smart appliances and solutions**
- Set of open standards (e.g. SAREF) for **Minimum Interoperability** and an open reference architecture
- New **business models**
- **Replicability** - as many countries (at least three) and entities as possible
- **Catalogue** of smart appliances, services and hardware/software solutions
- Open to **all stakeholders** with a role in the energy flexibility market
- Support the proliferation, acceptance and consumer participation in **innovative energy services**
- Adaptation of **digital technologies** to the specificities and requirements of the **energy system**
- Compliance to **cybersecurity** and **privacy** requirements
- **Cooperation** among projects from and outside the call

HORIZON-CL5-2022-D3-01-12

Replicable solutions for a cross sector compliant energy ecosystem



Expected outcome

- A **catalogue of services and appliances** tailor-made for specific consumer groups, and the accompanying IT-tools, providing flexibility services to the energy market and system.
- Increased **participation of energy consumers** in demand side flexibility markets by reducing entry barriers and transaction cost, in particular in relation to data exchange and market access.
- **Viable interoperable solutions and products**, for the grid and the home, which increase flexibility, balance demand/response and increase the share of renewable energy sources.
- Vibrant **cross-sector ecosystem** open to new services provided by SMEs and start-ups.
- **Marketplaces** for smart appliances, services and HW/SW solutions compliant to **Minimum Interoperability**.
- Demonstrated potential for a **sustainable up-take** (coordinated across all projects from the call) based on components and solutions piloted in real life.

HORIZON-CL5-2022-D3-01-12

Replicable solutions for a cross sector compliant energy ecosystem



Type of action:

Innovation Action



EU contribution:

35 M€ (8-9 M€ per project)



Deadline:

26 April 2022

HORIZON-CL5-2022-D3-01-13

Energy system modelling, optimisation and planning tools



Scope

Building on existing open source models or on the opening of currently proprietary models, develop and validate **open source models of the components of the energy system** and provide **tools to integrate these into a system model** to satisfy the (future) needs in a geographical area

- **Component models** of cost and technical performances (incl. GHG); parametrised for local
- A **system modelling tool** shall integrate the component in a geographical area into a system model, allowing both **static and dynamic simulations**, (intraday, weekly and seasonal).
- The models and tools shall **be validated in two real-life geographical areas**: one macro-region (e.g. several small or large countries) and one large (possibly cross-border) industrial cluster.
- **Interviews with grid operators and public administrations** in all EU MS/ AC. The development will be **coordinated with Commission services**, *with possible involvement of EU associations (e.g. ACER) in an advisory group*
- The **models, tools and relevant documentation**, should be **published** under an appropriate **open license** on the Energy Modelling Platform for Europe . **Dissemination**, notably via BRIDGE and at the EMP-E annual conference, **supporting the platform** and organising the annual conference.

HORIZON-CL5-2022-D3-01-13

Development and pilot demonstration of heat upgrade technologies with supply temperature in the range 150-250°C



Expected outcome

Provide **public authorities and network operators** with:

- **customisable open source models of the components** of the energy system, as well as tools to assemble these into a **model (static/dynamic) of the energy system**
- **open source tool to better plan and optimise** the development of energy sources and infrastructure to meet the future energy needs in a geographical area

HORIZON-CL5-2022-D3-01-13

Development and pilot demonstration of heat upgrade technologies with supply temperature in the range 150-250°C



Type of action: Research and Innovation Action



EU contribution: around EUR 6 million per project; total budget: Eur 6 million



Deadline: 22 April 2022

HORIZON-CL5-2022-D3-01-14

Thermal energy storage solutions



Expected outcome

Off peak electricity stored in the form of heat with innovative thermal energy storage solutions (TES) and used at peak hours in buildings (connected or not to district heating) for space heating / cooling and hot tap water heating.

- Peak load reduction
- Energy saving
- Energy cost minimisation
- Storage autonomy: 4 weeks
- Low starting TRL (4); TRL 6-7 by the end of the project.

HORIZON-CL5-2022-D3-01-14

Thermal energy storage solutions



Scope

Thermal energy storage systems based on Phase Changing Materials (PCM) and Thermochemical Materials (TCM) - Ice cold storage having higher TRL (6)

- Novel thermal energy storage system much more compact than state-of-the-art technologies (high reaction heat; good reversibility; fast charging and discharging rates; stable reaction products; non-toxic, non-corrosive, non-flammable and non-explosive reactants and products; large-scale availabilities and abundance, affordable price).
- Short to long run & small to big sizes
- Development & adaptation of available heat exchanger and novel reactor designs
- Design and development of controls and modelling for novel sensors
- Typical charging power 3 kW for periods of up to three hours.
- High volumetric energy storage density (kWh/m³): start – 4 weeks
- Cost reduction solutions

HORIZON-CL5-2022-D3-01-14

Thermal energy storage solutions



Type of Action: Coordination and Support Action



EU contribution: EUR 30 million



Deadline: 26 April 2022



Thank you!

HorizonEU

<http://ec.europa.eu/horizon-europe>



© European Union 2021

Unless otherwise noted the reuse of this presentation is authorised under the [CC BY 4.0](https://creativecommons.org/licenses/by/4.0/) license. For any use or reproduction of elements that are not owned by the EU, permission may need to be sought directly from the respective right holders.
Image credits: © ivector #235536634, #249868181, #251163013, #266009682, #273480523, #362422833, #241215668, #244690530, #245719946, #251163053, #252508849, 2020. Source: Stock.Adobe.com. Icons © Flaticon – all rights reserved.