



#HorizonEU

THE EU  
RESEARCH & INNOVATION  
PROGRAMME

2021 – 2027

**CLUSTER 5 Climate,  
Energy & Mobility**



EUROPEAN UNION

# CLUSTER 5 Climate, Energy & Mobility

INFO DAY 2022 - 3 February 2022

# WELCOME

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THE EU RESEARCH & INNOVATION PROGRAMME 2021 - 2027

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# 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>*

# CLUSTER 5 Climate, Energy, Mobility



*Virtual INFO DAY 2022 – 3 February 2022*

## Destination 3

Global leadership in renewable energy



THOMAS SCHLEKER

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HORIZON-CL5-2022-D3-02



# HORIZON-CL5-2022-D3-02-01

## Digital solutions for defining synergies in international renewable energy value chains



### Scope

- **Development of novel real time and open data monitoring and/or simulation solutions** (e.g. including digital twins) for sustainable energy production and consumption, predictive modelling and artificial intelligence for the analysis of **international renewable energy value chains** and for internationally aligned decision-making in cooperation with international partners from **Mission Innovation** Countries.
- To ensure trustworthiness, wide adoption by user communities and support EU policy-makers, actions should promote the highest standards of **transparency and openness**, going well beyond documentation and extending to aspects such as assumptions, models and data related to renewable energy and fuels.
- The consortium must include as a beneficiary at least one legal entity established in a Mission Innovation Country, not being Member State or Associated Country.

**Cross-cutting Priorities:**  
International Cooperation



### Expected outcome

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

- Advance the European and global **scientific basis, European leadership** and global role in the area of renewable energy and renewable fuels and related energy value chains while creating evidence for policy making by developing novel digital solutions.
- Provide **digital breakthrough solutions** for promoting the increase of the global renewable energy share.
- Reinforce the European scientific basis through **international collaboration** while increasing the potential to export European renewable energy technologies and ensuring political priorities in the context of sustainable global energy value chains.
- **Improve reliability** of system components, advanced and automated functions for data analysis, diagnosis and fault detection, forecasting and model-predictive control frameworks, ancillary services for the stability of the network; maintenance planning and/or reporting.



# HORIZON-CL5-2022-D3-02-01

## Digital solutions for defining synergies in international renewable energy value chains



### Type of action: Research and Innovation Actions

Activities are expected to achieve TRL 5 by the end of the project



**EU contribution: around EUR 3.00 million** (total: EUR 9.00 million)



**Deadline:**

**Opening: 26 May 2022**

**Deadline: 27 October 2022**

# HORIZON-CL5-2022-D3-02-02

## AU-EU Energy System Modelling



### Scope

- ...proposal should develop and test models for decision makers and planners to design and evaluate energy system(s) with a high penetration of renewable energy generation in African countries through a regional approach. Considerations are to be given to climate neutrality of cities and industries, using no fossil fuels. A focus should be made on the introduction of clean energy technologies. The tests should be done for at least two base cases...
- ...Actions should promote the highest standards of transparency in model adoption, including assumptions, architecture, code and data. The outcome of the project should be widely disseminated and all the source codes of the whole model to be open source and open access to stimulate future development. To ensure future uses, African experts in energy and in models development should be full partners in the project. The project should identify further local training needs...



### Expected outcome

to contribute to all

Reinforce the activities in the long term the AU-EU HLPD CCSE Partnership

Provide knowledge and scientific energy system modelling as evidence base including the environmental, social and economic trade-offs to contribute to R&I strategy and policy making

Increase clean energy generation in the African energy systems.

A permanent network of African experts and expertise in this area.



## Special topic conditions:

### Eligibility Conditions (exceptions from conditions described in General Annex B)

Due to the scope of this topic, legal entities established in all member states of the African Union are exceptionally eligible for Union funding.

In addition to the conditions described in General Annex B, the consortium must include at least three legal entities from three different African countries.

#### Type of Action

Research and Innovation  
Actions

#### Technology Readiness Level

N/A

#### EU Contribution

Indicative budget for the topic:  
€ 5.00 million

Expected EU contribution per  
project: ~ € 2.50 million

Expected funded projects: 2

#### Dates

**Opening: 26 May 2022**

**Deadline: 27 October 2022**

# HORIZON-CL5-2022-D3-02-03

## Innovative renewable energy carrier production for heating from renewable energies



### Scope

**Demonstrate cost-effective and energy-, catalyst and equipment material-efficient transformation** of renewable energy into **renewable energy carriers for heating**, while ensuring very good **combustion properties** in respect of efficiency and avoidance of pollutants and environmental and socioeconomic **sustainability** of the respective heating supply and value chains.

# HORIZON-CL5-2022-D3-02-03

## Innovative renewable energy carrier production for heating from renewable energies



### Expected outcome

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

- Advance the **European innovative knowledge basis** and increase technology competitiveness in the area of energy carrier production and heating value chains, in particular increase of feedstock availability for renewable heating, thus supporting the EU goals for climate protection, energy independence and economic growth;
- **Technology de-risk of renewable energy carrier value chains** as a necessary step before scaling up at commercial level;
- Enhanced **sustainability** of renewable heating value and supply chains by improving techno-economic efficiency and minimising negative environmental effects.

# HORIZON-CL5-2022-D3-02-03

## Innovative renewable energy carrier production for heating from renewable energies



### Type of action: Innovation Actions

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



**EU contribution: around EUR 10.00 million** (total: EUR 10.00 million)



**Deadline:**

**Opening: 26 May 2022**

**Deadline: 27 October 2022**

# HORIZON-CL5-2022-D3-02-04

## Technological interfaces between solar fuel technologies and other renewables



### Scope

**Development** of energy transmitting technological **interfaces to couple solar fuel technologies to other renewables** such as from e.g. biosources or directly connected renewable power generation, which allow for **efficient feed in** of other forms of renewable energy into **solar fuel conversion** technologies and allow for efficient and **continuous renewable fuel production**.



# HORIZON-CL5-2022-D3-02-04

## Technological interfaces between solar fuel technologies and other renewables



### Expected outcome

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

- Advance the **European scientific basis, technological leadership** and global role in the area of renewable and solar fuels, while creating evidence for policy making;
- Provide **breakthrough solutions** towards a fossil-free economy and ecosystem by bridging solar energy and other renewables in boosting renewable fuel production and storage with the potential of strongly reducing **CAPEX and OPEX/toe**, high penetration in the energy system, ensuring stability and security of energy supply;
- Increase **European technology competitiveness** in solar and renewable fuel technologies, thus supporting the EU goals for climate protection, energy independence and economic growth.

# HORIZON-CL5-2022-D3-02-04

## Technological interfaces between solar fuel technologies and other renewables



### Type of action: Research and Innovation Actions

Activities are expected to achieve TRL 4 by the end of the project



**EU contribution: between EUR 3.00 and 5.00 million (total: EUR 10.00 million)**



**Deadline:**

**Opening: 26 May 2022**  
**Deadline: 27 October 2022**

# HORIZON-CL5-2022-D3-02-05

## Renewable energy carriers from variable renewable electricity surplus and carbon emissions from energy consuming sectors



### Scope

- **Demonstration of renewable energy carrier synthesis from variable renewable electricity surplus and carbon emissions from energy consuming sectors**, which is targeting improvement of the overall synthesis value chain efficiency and viability while making best use of the CO<sub>2</sub> emissions in synergy with renewable electricity generation. The **incorporation of hybrids of renewable electricity with algal or synthetic renewable fuels in energy intensive sectors** by integrating the conversion of surplus renewable electricity and carbon emissions from these sectors to liquid renewable energy carriers by **algal, artificial photosynthesis or homologous non-solar pathways** will be demonstrated. Conversion technologies should be based upon **biological, biochemical, thermochemical and or electrochemical processes**.
- Proposals should avoid curtailing of renewable electricity and carbon emissions and improve overall efficiency and viability of renewable electricity assemblies in synergy with reduction of carbon emissions.

### Cross-cutting Priorities:

Socio-economic science and humanities

# HORIZON-CL5-2022-D3-02-05

## Renewable energy carriers from variable renewable electricity surplus and carbon emissions from energy consuming sectors



### Expected outcome

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

- Advance the **European scientific basis and increase technology competitiveness** in the area of energy carrier production and integration with renewable electricity and carbon value and supply chains;
- **Technology de-risk** of renewable energy carrier value chains through demonstration as a necessary step before scaling up at commercial level;
- **Enhanced sustainability** of renewable energy carrier value and supply chains by improving techno-economic efficiency and avoidance of CO<sub>2</sub>/GHG emissions and renewable electricity economic or curtailment losses and supported by a life cycle assessment.

# HORIZON-CL5-2022-D3-02-05

**Renewable energy carriers from variable renewable electricity surplus  
and carbon emissions from energy consuming sectors**



## **Type of action: Innovation Actions**

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



**EU contribution: around 10.00 million** (total: EUR 20.00 million)



**Deadline:**

**Opening: 26 May 2022**

**Deadline: 27 October 2022**

# HORIZON-CL5-2022-D3-02-06

## Direct renewable energy integration into process energy demands of the chemical industry



### Scope

**Development of the technology and the methodology of integrating renewable energy in chemical processing by substituting fossil process energy in chemical industry**, which has a high carbon footprint due to processing relative to the mass of the final product. Pursued technology developments are expected to **directly target renewable energy integration into process energy demands of the chemical industry beyond electricity** (targeting e.g. electrochemical potential of artificial photosynthesis to chemical reduction processes and/or e.g. direct solar thermochemical conversion) and should improve **GHG balance and sustainability** of the targeted process.

Possible synergies exist with topic: **HORIZON-CL4-2021-TWIN-TRANSITION-01-21**: Design and optimisation of energy flexible industrial processes (IA).

# HORIZON-CL5-2022-D3-02-06

## Direct renewable energy integration into process energy demands of the chemical industry



### Expected outcome

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

- Advance the **European scientific basis, technological leadership** and global role in the area of renewable integration into the chemical industry, while creating evidence for policy making;
- Increase **European technology competitiveness** in renewable process energy technologies, thus supporting the EU goals for climate protection, energy independence and economic growth;
- Provide **breakthrough solutions** towards a fossil-free economy and ecosystem;
- Allow **high penetration in the energy system**, ensure stability and security of energy supply, including integration of local resources, and gain efficiency and costs in transforming the energy system on a fossil-free basis;
- Enable **transformation** of the energy supply to socio-economic and environmental fossil-free sustainable solutions across **energy intensive chemical industry**, targeting in particular process energy and its GHG emissions.

# HORIZON-CL5-2022-D3-02-06

## Direct renewable energy integration into process energy demands of the chemical industry



### Type of action: Research and Innovation Actions

Activities are expected to achieve TRL 4-5 by the end of the project



**EU contribution: between EUR 3.00 and 5.00 million (total: EUR 10.00 million)**



**Deadline:**

**Opening: 26 May 2022**

**Deadline: 27 October 2022**





### Scope

Demonstrate incorporation of renewable energy technologies **in agriculture or forestry** to meet its **electricity, heat, cold, waste and land management needs**. Solutions should **combine** innovative renewable, circular and **regional value chains from different renewables** and **adapted storage** options to de-fossilize agricultural or forest processes trans-seasonally, taking into account **hybridization compatibility**. They should also address **one of the two options**:

- Transformation of **agricultural or forest wastes to renewable energy carriers in situ**, e.g. by modular slow pyrolysis units, using renewable energy for process energy needs. Solutions should improve cost-effectiveness and sustainability of agriculture or forest seasonal energy demand based on renewables



### Scope

- Development of renewable-based **agricultural protocols for multiple and cover cropping and/ or mixed cropping** which increase carbon sequestration and soil organic matter and reduce pesticides, combined with **transformation to renewable energy carriers in situ**, e.g. by biogas production, in a circular approach for soil nutrients and carbon. Positive effects on soil biodiversity/soil health and soil functionality as regards **increasing soil organic matter, phosphorus** and other **nutrients** and reducing the risk on **groundwater contamination** from nitrogen oxides should be assessed. Solutions should improve the cost-effectiveness and the sustainability (including biodiversity) of agricultural waste and land management through valorisation of wastes and secondary crops based on renewable energy technologies.

Required effective contribution of SSH disciplines and the involvement of SSH experts, Institutions as well as the inclusion of relevant SSH expertise.

# HORIZON-CL5-2022-D3-02-07

## Renewable energy incorporation in agriculture and forestry



### Expected outcome

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

- Promote **decentralised renewable energy use** and cost-efficient **decentralized production** of renewable energy carriers.
- Reduce agriculture and forestry **carbon footprint** from own energy consumption and agricultural/forest waste management.
- Increase **sustainability** and **circularity** in **agriculture** while creating positive effects on biodiversity.
- Increase **sustainability** and **circularity** in **forestry**.
- Foster **regional development** in rural areas.
- Support **farmers' and foresters' engagement** as prosumers of renewable energy. .

# HORIZON-CL5-2022-D3-02-07

## Renewable energy incorporation in agriculture and forestry



### Specific Conditions

- Type of action: **Innovation Actions**
- Technology Readiness Level: **Expected TRL 6-7 by end of project**



### EU contribution:

- Total indicative budget for the topic: **€ 15.00 million**
- Expected EU contribution per project: **€ 7.50 million**
- Expected number of funded projects: **2**



### Deadline:

**Opening: 26 May 2022**  
**Deadline: 27 October 2022**

# HORIZON-CL5-2022-D3-02-08

## Demonstration of complete value chains for advanced biofuel and non-biological renewable fuel production



### Scope

Demonstrate innovative and cost effective sustainable value chains for **advanced biofuels or synthetic renewable fuels** of non-biological origin (other than for hydrogen as a final product), over the **entire cycle** from feedstock to end use. Any **sustainable biomass feedstock** including residues and wastes, or biogenic CO<sub>2</sub> or industrial CO<sub>2</sub> and renewable hydrogen, as well as **input energy** to the conversion should be addressed. Pathways which are **biochemical, thermochemical, biological, chemical, electrochemical or combinations** of them should be considered. Proposals should aim at improved performance in terms of increasing the **efficiency** and **sustainability** and reducing the **cost**, while evidencing the **value creation** along the value chain steps. Complete value chains may address **any relevant end use**.

# HORIZON-CL5-2022-D3-02-08

## Demonstration of complete value chains for advanced biofuel and non-biological renewable fuel production



### Expected outcome

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

- Build a **portfolio of complete value chains** for advanced biofuels and renewable fuels of non-biological origin.
- **De-risk technology, boost the scale-up** of advanced biofuels and non-biological origin renewable fuels.
- Contribute to the priorities of the **SET Plan Action 8**.
- Respond to **short** and **medium term** needs for renewable fuels in energy and transport.
- Improve **sustainability** and **security** of the value chains.

# HORIZON-CL5-2022-D3-02-08

## Demonstration of complete value chains for advanced biofuel and non-biological renewable fuel production



### Specific Conditions

- Type of action: **Innovation Actions**
- Technology Readiness Level: **Expected TRL 6-7 by end of project**



### EU contribution:

- Total indicative budget for the topic: **€ 20.00 million**
- Expected EU contribution per project: **€ 10.00 million**
- Expected number of funded projects: **2**



### Deadline:

**Opening: 26 May 2022**  
**Deadline: 27 October 2022**



# Thank you!

## # HorizonEU

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