

CETPartnership Joint Call 2023

30 June 2023

The Clean Energy Transition Partnership is a transnational joint programming initiative to boost and accelerate the energy transition, building upon regional and national RDI funding programmes. The initiative is receiving funding from the European Union's research and innovation programme "Horizon Europe" under Grant Agreement No 101069750.

Contents

1. Clean Energy Transition Partnership (CETPartnership).....	3
1.1. Scope.....	3
1.2. Transition Initiatives (TRIs)	4
1.3. CETPartnership Knowledge Community.....	5
2. Definitions	6
3. Call overview	7
4. Eligibility criteria and guidelines.....	10
4.1. Proposal submission	10
4.2. Project consortia.....	11
4.3. Project duration and budget.....	11
4.4. Research, development and innovation (RDI) approaches.....	12
4.5. Technology Readiness Levels (TRLs)	12
4.6. Cross-cutting dimensions.....	13
4.7. Reporting and Knowledge Community work package.....	13
4.8. Open science.....	13
4.9. Gender dimension	13
5. Evaluation criteria	15
6. Call process.....	16
6.1. Pre-proposal stage – Stage 1	16
6.2. Full proposal stage – Stage 2	17
7. Project implementation	20
7.1. Funding arrangements and period	20
7.2. Consortium Agreement (CA).....	20
7.3. Gender Equality Plans.....	20
7.4. Changes in projects.....	20
7.5. Reporting and dissemination.....	20
8. Call Modules.....	21
CM2023-01 Direct current (DC) technologies for power networks.....	22
CM2023-02 Energy system flexibility: renewables production, storage and system integration	27
CM2023-03A/03B Advanced renewable energy (RE) technologies for power production	30
CM2023-04 Carbon capture, utilisation, and storage (CCUS).....	34
CM2023-05 Hydrogen and renewable fuels	38
CM2023-06 Heating and cooling technologies	43
CM2023-07 Geothermal energy technologies	47
CM2023-08 Integrated regional energy systems	51
CM2023-09 Integrated industrial energy systems	56

CM2023-10A/10B Clean energy integration in the built environment.....	60
Annex A. Reporting and Knowledge Community work package.....	65
Task 1. Reporting	65
Task 2. Contribution to formative evaluation	65
Task 3. Contribution to other Knowledge Community activities	66
Annex B. National/regional requirements	67
Annex C. Funding Organisations' participation per Call Module (this information is tentative).....	68

DRAFT

1. Clean Energy Transition Partnership (CETPartnership)

1.1. Scope

The Clean Energy Transition Partnership (CETPartnership) aims at accelerating the clean energy transition to achieve the goal of climate neutrality by 2050. It is a multilateral and strategic partnership of national and regional research, development and innovation (RDI) funding programmes in EU Member States and Associated Countries, co-funded by the European Commission through Horizon Europe (HE).

The CETPartnership's goals are:

- Building a transnational transformative joint programming platform
- Developing and demonstrating technologies and solutions for the energy system transition
- Building innovation ecosystems that support capacity building at all levels

The CETPartnership supports the implementation of the European Strategic Energy Technology Plan (SET Plan)¹ and builds on existing SET Plan initiatives (ERA-Nets, IWGs, ETIPs, etc.). The partnership intends to contribute to the achievement of the EU decarbonisation targets set in A Clean Planet for all² and lastly in the Fit-for-55³ package and to support the implementation of the EU energy and climate strategy such as the EU strategy for energy system integration⁴, the EU strategy on hydrogen⁵, the EU strategy on offshore renewable energy⁶ and the REPowerEU Plan⁷. On a global level, the CETPartnership Joint Call 2023 (Call) is part of Mission Innovation (MI)⁸ call series, i.e. MICall23. As such, some of the call topics are directly prepared in collaboration with MI missions, and all topics of the call is open for applications that directly and/or indirectly contribute to the work of MI missions.

Read more about the CETPartnership on the website⁹ and in the CETPartnership Strategic Research and Innovation Agenda (SRIA)¹⁰.

¹ https://energy.ec.europa.eu/topics/research-and-technology/strategic-energy-technology-plan_en

² <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0773>

³ <https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/>

⁴ COM(2020) 299 final, <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2020:299:FIN>

⁵ COM(2020) 301, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0301>

⁶ COM(2020) 741 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2020:741:FIN>

⁷ COM/2022/230 final, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2022:230:FIN>

⁸ <http://mission-innovation.net/>

⁹ <https://cetpartnership.eu/>

¹⁰ https://cetpartnership.eu/sites/default/files/documentation/CETP%20SRIA_v1.0_endorsed_compressed_0.pdf

1.2. Transition Initiatives (TRIs)

The CETPartnership includes seven Transition Initiatives (TRIs) addressing a broad range of RDI challenges from discrete technologies to integrated systems for the clean energy transition, as well as several cross-cutting dimensions, as shown in Figure 1.1 and Table 1.1.

CETPartnership	
System integration	Enable technologies
TRI1 Net-zero emissions energy system	TRI2 Power technologies
TRI5 Regional energy systems	TRI3 Storage technologies, renewable fuels and CCU/CCS
TRI6 Industrial energy systems	TRI4 Heating and cooling
TRI7 Built environment	

FIGURE 1.1. CETPARTNERSHIP TRANSITION INITIATIVES (TRIS)

TABLE 1.1. AIMS OF TRANSITION INITIATIVES (TRIS)

TRI1: Net-zero emissions energy system

To develop optimised, integrated net-zero emissions energy systems, with electricity distribution and transmission grids as the “backbone” and with a high level of integration among all energy carrier networks, supported by energy storage and power conversion processes.

TRI2: Power technologies

To develop a pool of zero-emission power technologies and solutions based on renewable energy sources as the backbone of the future energy system, being able to deliver carbon-neutral electricity accessible to all and to contribute to the resilience of the system.

TRI3: Storage technologies, hydrogen, renewable fuels and CCU/CCS

To provide cleaner technological solutions for storage technologies, hydrogen, renewable fuels, CCU (Carbon Capture and Utilisation) and CCS (Carbon Capture and Storage) contributing to significant CO₂ reduction by 2030 and the climate neutrality by 2050.

TRI4: Heating and cooling

To provide enhanced and improved heating and cooling technologies and systems for all major parts of Europe by 2030 and to enable 100% climate-neutral heating and cooling by 2050.

TRI5: Regional energy systems

To develop and validate integrated regional and local energy systems that efficiently enable a secure, resilient and CO₂-free regional energy supply for a specific regional context (up to and beyond 100% in the dynamic regional or local supply by 2030) and provide tailor-made solutions for individual regional and bring them together at European level.

TRI6: Industrial energy systems

To develop and demonstrate a set of technical solutions for integrated industrial energy systems that enables efficient carbon-neutral industrial production sites as parts of the entire energy system.

TRI7: Built environment

To provide solutions and technologies for existing and new buildings to become an active element in the energy system, with enhanced capability to produce, store and efficiently use energy.

The CETPartnership supports a paradigm shift with an integrated approach to innovation considering not only technological aspects (Technology), but also business aspects (Market) and social and political aspects (Stakeholders). This implies a cross-sectoral and interdisciplinary approach, including aspects such as system integration of technologies, products, services, tools, business processes, market structures, regulatory regimes, policies as well as security, privacy and resilience. Such an approach to foster innovation is structured and facilitated by the framework of the Three-layer Research Model, which can be used in project design (mandatory in some part of the Call). Read more about the model

on the [CETPartnership website](https://cetpartnership.eu/)¹¹.

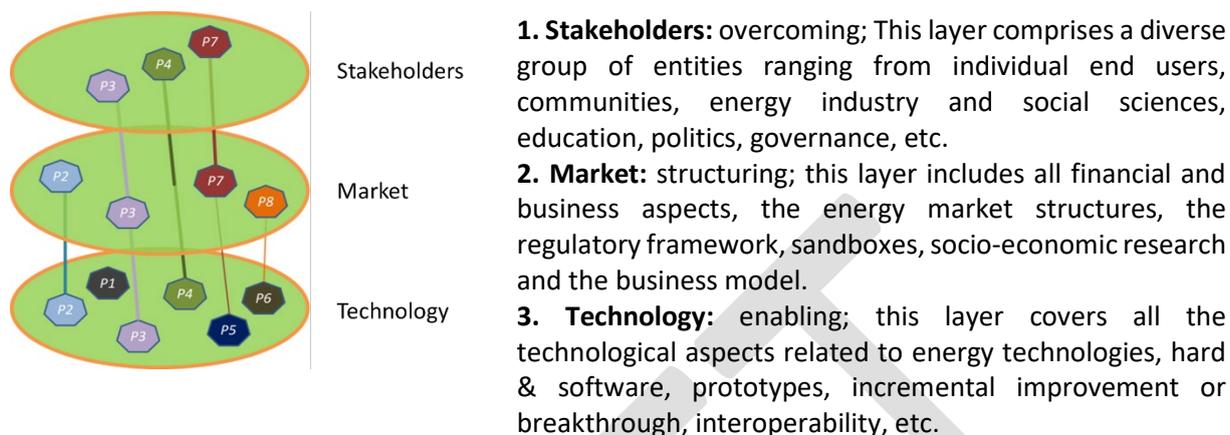


FIGURE 1.2: THREE LAYER RESEARCH MODEL

1.3. CETPartnership Knowledge Community

The CETPartnership Knowledge Community is an integral part of the CETPartnership and aims to leverage exchange and co-create knowledge between RDI stakeholders, all CETPartnership funded projects and other national, transnational and international CETPartnership activities. It is intended to act as an information platform, to develop and present state-of-the-art knowledge, to lead discussions and to strengthen multilateral collaboration between research, industry, policy and society in the field of the clean energy transition. Through strategic knowledge management, outcomes of RDI will provide an evidence and fact base for policymaking in support of the clean energy transition in domains of innovation, market entry and diffusion as well as regulation and procurement.

The CETPartnership Knowledge Community will implement innovative monitoring and transfer activities and generate synergies for knowledge co-creation in working groups, in the thematic challenges addressed by TRIs and in the cross-cutting dimensions according to the [CETPartnership SRIA](#)¹². It will be organised by the CETPartnership Knowledge Community Management (KCM) using the CETPartnership Digital Collaboration Platform. The CETPartnership Knowledge Community will also relate to the CETPartnership Impact Network partners that can contribute to dissemination and exploitation of knowledge.

¹¹ <https://cetpartnership.eu/>

¹² https://cetpartnership.eu/sites/default/files/documentation/CETP%20SRIA_v1.0_endorsed_compressed_0.pdf

2. Definitions

Project participants may belong to legal entities of any organisation type such as:

- Secondary and higher education establishments
- Research organisations (excluding education)
- Private for-profit companies
- Public bodies (excluding research and education)
- Other entities

A project consortium must be built to submit a proposal to the Call and may consist of the following **Project Consortium Partners**:

- A **Coordinator**: A legal entity participating with funding from the Call and responsible for coordinating and managing the project. The Coordinator cannot be changed after the deadline for pre-proposal submission and before the funding decision in the Call process.
- **Beneficiary Partners**: All Project Consortium Partners participating with funding from the Call (including the Coordinator)
- **Self-financed Partner(s)**: Project Consortium Partner(s) participating from any country with their costs declared but without applying for funding in the Call. Each Self-financed Partner must submit a Letter of Commitment in Stage 2 of the Call process (see **Subsection 6.2.1**).

All the Project Consortium Partners must be listed in the proposals and sign a Consortium Agreement at project start (see **Section 7.2**).

Except for the Project Consortium Partners, (an) **Associated Project Partner(s)** may participate from any country, without declaring their costs or applying for funding in the Call.

The call process includes two stages:

- a **pre-proposal** stage (Stage 1)
- a **full proposal** stage (Stage 2)

The term **proposal** refers to both the pre-proposal and the full proposal.

3. Call overview

The CETPartnership Joint Call 2023 is the second annual co-funded call under the CETPartnership and is open for participants from all over the world. To cover different topics and RDI approaches, the Call is structured into 12 **Call Modules**, aimed at different energy technologies and/or systems (see **Table 2.1** and **Chapter 8**). The Call Modules address different research-oriented approach (**ROA**) and innovation-oriented approach (**IOA**) (see **Section 4.4**) on different Technology Readiness Levels (TRLs)¹³ (see **Section 4.5**) and are thus complementing and completing each other.

TABLE 2.1. CALL MODULES

No.	Title	Contact
CM2023-01	Direct current (DC) technologies for power networks	TRI1@cetpartnership.eu
CM2023-02	Energy system flexibility: renewables production, storage and system integration	TRI1@cetpartnership.eu TRI2@cetpartnership.eu
CM2023-03A CM2023-03B	Advanced renewable energy technologies for power production	TRI2@cetpartnership.eu
CM2023-04	Carbon capture, utilisation, and storage (CCUS)	TRI3@cetpartnership.eu
CM2023-05	Hydrogen and renewable fuels	TRI3@cetpartnership.eu
CM2023-06	Heating and cooling technologies	TRI4@cetpartnership.eu
CM2023-07	Geothermal energy technologies	TRI4@cetpartnership.eu
CM2023-08	Integrated regional energy systems	TRI5@cetpartnership.eu
CM2023-09	Integrated industrial energy systems	TRI6@cetpartnership.eu
CM2023-10A CM2023-10B	Clean energy integration in the built environment	TRI7@cetpartnership.eu

Around 47 national/regional Funding Organisations (as defined in **Table 2.2**) participate with funding for proposals to different Call Modules (see **Annex B** and **Annex C**). The Funding Organisations allocate their budget to fund Beneficiary Partners based in their country/region and decide their budget allocation among different Call Modules at different times in the Call process. The total Call budget is over €121 million and additional funding from EC (so called top-up). The funding from EU will be used to top-up possibly exhausted budgets of the national/regional Funding Organisations from EU Member States and HE Associated Countries to fund projects.

TABLE 2.2. FUNDING ORGANISATIONS (TBC= participation to be confirmed)

Country	Region	Organisation name	Acronym
Austria		Austrian Research Promotion Agency	FFG
Belgium	Flanders	Fonds Innoveren en Ondernemen	FIO
	Wallonia	Service public de Wallonie	SPW
Canada	Alberta	Emissions Reduction Alberta	ERA
Cyprus		Research and Innovation Foundation	RIF
Czech Republic		Technology Agency of the Czech Republic	TA CR
Denmark		Energy Technology Development and Demonstration Programme	EUDP
		Innovation Fund Denmark	IFD

¹³ Definition in Horizon Europe Work Programme 2023-2024 13. General Annexes, https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-13-general-annexes_horizon-2023-2024_en.pdf

Estonia		Estonian Research Council	ETAG
		Ministry of Economic Affairs and Communications	MKM
Finland		Innovaatorahoituskeskus Business Finland	BF
France	(Federal)	Agence Nationale de la Recherche	ANR
		Agence de la transition écologique	ADEME
	Pays de la Loire	Pays de la Loire Region Council	RPL
Germany	(Federal)	Projektträger Jülich/Forschungszentrum Jülich GmbH (BMWK)	PtJ (BMWK)
	North Rhine-Westphalia	Projektträger Jülich/Forschungszentrum Jülich GmbH (MWIKE)	PtJ (MWIKE)
	Saxony	Saxon State Ministry for Science, Culture and Tourism	SMWK
Greece		General Secretariat for Research and Innovation	GSRI
Hungary		National Research, Development and Innovation Office	NKFIH
Iceland		The Icelandic Centre for Research	RANNIS
Ireland		Geological Survey Ireland	GSI
		Sustainable Energy Authority of Ireland	SEAI
Israel		Ministry of Energy	MoE
Italy		Ministry of Economic Development	MIMIT
		Ministero dell'Università e della Ricerca	MUR
Latvia		Latvian Council of Science TBC	LZP
Lithuania		Ministry of Energy of the Republic of Lithuania	ENMIN
Malta		Malta Council for Science and Technology	MCST
The Netherlands		Dutch Research Council TBC	NWO
		Netherlands Enterprise Agency	RVO
Norway		The Research Council of Norway	RCN
Poland		National Centre for Research and Development	NCBR
Portugal		Fundação para a Ciência e a Tecnologia	FCT
Romania		Executive Agency for Higher Education, Research, Development and Innovation Funding	UEFISCDI
Spain	(Federal)	Agencia Estatal de Investigación	AEI
		Centre for the Development of Technology and Innovation.	CDTI
	Asturias	Fundación para el fomento en Asturias de la Investigación Científica Aplicada y la Tecnología	FICYT
	Basque	Departamento de Desarrollo Económico, Sostenibilidad y Medio Ambiente. Eusko Jaurlaritzza-Gobierno Vasco	EUSKADI
		Ente Vasco de la Energía	EVE
	Cantabria	Regional Development Agency of Cantabria TBC	SODERCAN
Sweden		Swedish Energy Agency	SWEA
Switzerland		Federal Department of the Environment, Transport, Energy and Communications	DETEC
		Swiss National Science Foundation	SNSF
Tunisia		Ministry of Higher Education and Scientific Research	MHESR
Türkiye		The Scientific and Technological Research Council of Türkiye	TUBITAK
United Kingdom	Scotland	Scottish Enterprise	SE
The United States of America		Department of Energy	DOE

The Call is performed in two stages; a pre-proposal stage (Stage 1) and a full proposal stage (Stage 2), see **Table 2.3** and **Chapter 6**. A project consortium chooses one Call Module for their pre-proposal (Stage 1). If the pre-proposal is selected in Stage 1, the project consortium is invited to submit a full proposal (Stage 2). If the proposal is selected in Stage 2, the eligible project costs can be funded by the relevant Funding Organisations.

TABLE 2.3. CALL TIMELINE

Opening for pre-proposal submission (Stage 1)	20 September 2023
Deadline for pre-proposal submission	22 November 2023, 14:00 CET
Opening for full proposal submission (Stage 2)	25 January 2024
Deadline for full proposal submission	27 March 2024, 14:00 CET
Funding decision communicated	End of June 2024
Project start	1 September–15 December 2024

In both Stage 1 and 2, the proposals will be checked according to eligibility criteria and requirements set for the Call in general (see **Chapter 4**), Call Modules (see also **Chapter 8**) and Funding Organisations (see also **Annex B**) and will be evaluated according to evaluation criteria (see **Chapter 5**), ranked per Call Module and selected according to available funding. Proposals must pass both Stage 1 and 2 to be considered for funding in the Call.

For a proposal to be considered for selection, at least three independent legal entities (i.e. at least one Coordinator and two other Beneficiary Partners) must have been deemed eligible by relevant Funding Organisations from at least three different countries participating in the Call, according to their national/regional requirements. Of these three entities, at least two must be from EU Member States or HE Associated Countries (see **Section 4.2**). Project Consortium Partners in EU/EEA countries can be funded according to the EU/EEA State aid rules. Project Consortium Partners outside EU Member States and HE Associated Countries may be eligible for funding from the CETPartnership Associated Partners¹⁴ or Non-associated Partners¹⁵.

All Project Consortium Partners are encouraged to check carefully all eligibility criteria and requirements. Different Call Modules and Funding Organisations may support different organisation and RDI types, TRLs etc. Some Funding Organisations require submission of additional information from applicable Project Consortium Partners. In this case, the Funding Organisations have own submission procedure such as deadlines, portals and templates (see **Annex B**).

GENERAL QUESTIONS ABOUT THE CALL should be addressed to the CETPartnership Call Management (**Call Management**) (callmanagement@cetpartnership.eu).

QUESTIONS ABOUT THE CALL MODULES should be addressed to respective Call Module contacts, see **Table 2.1**.

QUESTIONS ABOUT THE NATIONAL/REGIONAL REQUIREMENTS should be addressed to respective Funding Organisations, see **Annex B**.

¹⁴ The CETPartnership Associated Partners are Funding Organisations that participate in the CETPartnership Consortium from non-EU Member States/HE Associated Countries.

¹⁵ The CETPartnership Non-Associated Partners are Funding Organisations that do not participate in the CETPartnership Consortium but have signed a funding commitment to the Call.

4. Eligibility criteria and guidelines

The Call includes the following eligibility criteria and requirements:

- Transnational eligibility criteria, applicable for all project consortia applying to the Call
- Call Module requirements, applicable for project consortia applying to Call Modules with specific requirements, see also Chapter 8
- National/regional requirements, applicable for Project Consortium Partners applying for funding from Funding Organisations in the Call, see also Annex B

TABLE 4.1. SUMMARY OF TRANSNATIONAL ELIGIBILITY CRITERIA

1	The proposal must be written in English and submitted on the CETPartnership Submission Platform before the deadlines, following mandatory proposal templates.
2	A project consortium must be built of at least three independent legal entities (i.e. at least one Coordinator and two other Beneficiary Partners) applying and deemed eligible for funding by relevant national/regional Funding Organisations from at least three different countries participating in the Call. Of these three entities, at least two must be from EU Member States or HE Associated Countries.
3	The total effort of one Project Consortium Partner in the project consortium can be maximum 60% of the total project efforts (measured in person months).
4	The total effort of Project Consortium Partners from one country/region in the project consortium can be maximum 75% of the total project efforts (measured in person months).
5	The following individuals are ineligible for proposal submission: CETPartnership Governing Board members, CETPartnership General Assembly members and researchers from the Funding Organisations in the Call. ¹⁶
6	The project must start before 15 December 2024.
7	The project must finish in 36 months from the start of the project.
8	The proposals must include a work package called Reporting and Knowledge Community in their work plan.

Below, eligibility criteria and requirements are described in lists (➤) and guidelines and recommendations in texts.

4.1. Proposal submission

- A proposal must be written in English and submitted on the CETPartnership Submission Platform¹⁷ before the deadlines, following mandatory proposal templates with instructions regarding the total page number, the page margins, and the font type and size. The mandatory proposal templates are available for download on the start page of the Submission Platform. To be considered for selection, submission of a pre-proposal is mandatory for each project consortium, and submission of a full proposal is mandatory for each invited project consortium. Resubmission or revision of the proposal will be denied after the submission deadline unless it is requested by the Call Management. (**TRANSNATIONAL ELIGIBILITY CRITERION**)

¹⁶ Legal entities who are able to provide written proof that their organisational structure is completely separated from those of the Funding Organisation participating in the Call may under these exceptional circumstances submit their proposal to the Call.

¹⁷ <https://cetp-submission.mur.gov.it/>

1)

- Some national/regional Funding Organisations additionally require submission on national/regional level; see respective national/regional requirements in **Annex B**.

4.2. Project consortia

- A project consortium must be built of at least three independent legal entities (i.e. at least one Coordinator and two Beneficiary Partners) applying and deemed eligible for funding by relevant national/regional Funding Organisations (see requirements in **Annex B**) from at least three different countries participating in the Call. Of these three entities, at least two must be from EU Member States or HE Associated Countries¹⁸. (**TRANSNATIONAL ELIGIBILITY CRITERION 2**)
- The total effort of one Project Consortium Partner in the project consortium can be maximum 60% of the total project efforts (measured in person months). (**TRANSNATIONAL ELIGIBILITY CRITERION 3**)
- The total effort of Project Consortium Partners from one country/region in the project consortium can be maximum 75% of the total project efforts (measured in person months). (**TRANSNATIONAL ELIGIBILITY CRITERION 4**)
- The following individuals are ineligible for proposal submission: CETPartnership Governing Board members, CETPartnership General Assembly members or researchers from the Funding Organisations in the Call. Legal entities who are able to provide written proof that their organisational structure is completely separated from those of the Funding Organisation participating in the Call may under these exceptional circumstances submit their proposal to the Call. (**TRANSNATIONAL ELIGIBILITY CRITERION 5**)
- Specific Call Module requirements may apply regarding the project consortia; see **Project consortia** in respective Call Modules in **Chapter 8**.
- Specific National/regional requirements may apply regarding the project consortia; see respective national/regional requirements in **Annex B**.

Any Self-financed Partner can participate in a project consortium fulfilling **TRANSNATIONAL ELIGIBILITY CRITERION 2**. Each Self-financed Partner is expected to enclose a Letter of Commitment with the full proposal (see **Subsection 6.2.1**).

No individual involved in a proposal can act as an evaluator in the Call.

4.3. Project duration and budget

- The project must start before 15 December 2024. (**TRANSNATIONAL ELIGIBILITY CRITERION 6**)
- The project must finish in 36 months from the start of the project. (**TRANSNATIONAL ELIGIBILITY CRITERION 7**)
- Specific Call Module requirements may apply regarding the project duration and budget, see **Project duration** and **Project budget** in respective Call Modules in **Chapter 8**.
- Specific National/regional requirements may apply regarding the project duration and/or budget; see respective national/regional requirements in **Annex B**.

The Call generally aims to support projects applying for funding in the Call in the range of (but not

¹⁸ List of Participating Countries in Horizon Europe, https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/list-3rd-country-participation_horizon-euratom_en.pdf

limited to) EUR 0.5–5 million.

4.4. Research, development and innovation (RDI) approaches

- Specific Call Module requirements may apply regarding the RDI approaches; see **Target RDI approaches/TRLs** in respective Call Modules in **Chapter 8**.
- Specific National/regional requirements may apply regarding RDI approaches; see respective national/regional requirements in **Annex B**.

The following RDI approaches may apply:

- **Research-oriented approach (ROA)** aims at creating knowledge or exploring the feasibility of a new or improved technology, product, process, service or solution and includes applied research, technology development and integration, testing, demonstration and validation of a small-scale prototype in a laboratory or simulated environment.
- **Innovation-oriented approach (IOA)** aims at developing plans and arrangements or designs for new or improved products, processes or services and includes prototyping, testing, demonstrating, piloting, large-scale product validation in an operational environment, and market replication.

4.5. Technology Readiness Levels (TRLs)

- Specific Call Module requirements may apply regarding the TRLs; see **Target RDI approaches/TRLs** in respective Call Modules in **Chapter 8**.
- Specific National/regional requirements may apply regarding the TRLs; see respective national/regional requirements in **Annex B**.

The Call applies the same definition of TRLs as in the HE programme¹⁹.

Since the CETPartnership aims at accelerating the clean energy transition to achieve the goal of climate neutrality by 2050, the Call generally aims at funding projects to reach medium to high TRLs (4–8), combining technologies with societal, commercial, financial, environmental, regulatory and other critical aspects. In some cases, projects may include activities at lower or higher TRLs based on specific needs to reach project goals or fulfil national/regional requirements.

Other frameworks than TRLs may apply as well in some Call Modules. For example, the Commercial Readiness Index (CRI)²⁰ describes solutions in terms of their commercial value proposition and ability to obtain financing for deployment. The Societal Readiness Level (SRL)²¹ is a way of assessing the level of societal adaptation of solutions. In addition, the Smart Readiness Indicator (SRI)²² is a common EU scheme for rating the smart readiness of buildings.

¹⁹ https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-13-general-annexes_horizon-2023-2024_en.pdf

²⁰ <https://arena.gov.au/assets/2014/02/Commercial-Readiness-Index.pdf>

²¹ https://innovationsfonden.dk/sites/default/files/2019-03/societal_readiness_levels_-_srl.pdf

²² https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/smart-readiness-indicator_en

4.6. Cross-cutting dimensions

- Specific Call Module requirements may apply regarding the cross-cutting dimensions; see **Objectives, Scope, Target topics, Expected impact, Target RDI approaches/TRLs and Project consortia** in respective Call Modules in **Chapter 8**.

The cross-cutting dimensions are an integral part of the CETPartnership. They can be transition pathways, circularity, digitalisation as well as policy and social aspects and include different societal stakeholders and innovation ecosystems. Such a cross-sectoral and interdisciplinary approach can be structured in project design with the help of the Three-layer Research Model (see **Section 1.2**).

Following are aspects that can be considered to enable and accelerate the transition towards a net zero society in the CETPartnership:

- Identifying robust transition pathways toward a net zero society
- Encouraging transition based on resource efficiency and circularity principles
- Encouraging digitalisation of transition processes
- Accelerating transition through innovation ecosystems
- Developing policies and actions to ensure a fair, just and democratic transition
- Understanding effects of regulation and market design on transition in short and long term

Read more about the cross-cutting dimensions in the [CETPartnership SRIA](#)²³.

A proposal that extends any approach/result from ongoing projects can be considered in this Call if it is explicitly distinguished from the ongoing projects.

4.7. Reporting and Knowledge Community work package

- The proposals must include a work package called Reporting and Knowledge Community in their work plan (see **Annex A**), since projects funded by the Call are expected to actively participate in the CETPartnership Knowledge Community and exchange knowledge, read more in **Section 1.3. (TRANSNATIONAL ELIGIBILITY CRITERION 8)**

When developing the proposals, it is important to consider the concept and content of the CETPartnership Knowledge Community as well as uses and synergies which will be created there.

4.8. Open science

The proposals will be evaluated regarding open science under the criterion Excellence (see **Chapter 5**). Please consider carefully the [EU's open science policy](#)²⁴.

4.9. Gender dimension

The proposals will be evaluated regarding the gender dimension of the research and innovation,

²³ https://cetpartnership.eu/sites/default/files/documentation/CETP%20SRIA_v1.0_endorsed_compressed_0.pdf

²⁴ https://research-and-innovation.ec.europa.eu/strategy/strategy-2020-2024/our-digital-future/open-science_en

project outcome and stakeholder engagement under the criterion Excellence (see **Chapter 5**). Gender balance in personnel named in the proposals will be one of the criteria to decide in case of ex aequo proposals.

In the CETPartnership, the gender dimension will be considered to eliminate gender inequality and intersecting socioeconomic inequalities throughout research and innovation systems, including by addressing unconscious bias and systemic structural barriers. CETPartnership promotes gender balance among personnel in a project consortium.

At project implementation, the Beneficiary Partners must follow HE Guidance on Gender Equality Plans (GEPs), see **Section 7.3**.

DRAFT

5. Evaluation criteria

In both Stage 1 and 2, the proposals will be evaluated according to the following main evaluation criteria:

- **Excellence**
- **Impact**
- **Quality and efficiency of the implementation**

For proposal evaluation, scores will be awarded for each of the three main criteria. Each criterion will be scored out of 5 (half scores are not allowed) and equally weighted.

The **cut-off** for being invited to Stage 2 or considered for selection in Stage 2 is a score at or above 10 and none of the criteria scoring below 3. It means that the scores must pass the individual threshold AND the overall threshold if a proposal is to proceed to Stage 2. The same rule applies for proposals to be considered for selection in Stage 2.

The following **sub-criteria** will be used in all the Call Modules to determine the scores for the three main criteria. Call Module sub-criteria may apply in addition, see **Chapter 8**.

Excellence

- Clarity and pertinence of the project's objectives, and the extent to which the proposed work is ambitious, and goes beyond the state-of-the-art.
- Soundness of the proposed methodology, including the underlying concepts, models, assumptions, inter-disciplinary approaches, appropriate consideration of the gender dimension in research and innovation content, and the quality of open science practices, including sharing and management of research and innovation outputs and engagement of citizens, civil society and end users where appropriate.

Impact

- Likely scale and significance of the expected outcomes and impacts including the added value of the transnational collaboration, and credibility of the pathways to achieve the expected outcomes and impacts specified in the work programme.
- Suitability and quality of the measures to maximise expected outcomes and impacts, as set out in the dissemination and exploitation plan, including communication activities.
- Extent to which the project is relevant for the energy transition through appropriate involvement of end-users, need-owners and/or the private sector.

Quality and efficiency of the implementation

- Quality and effectiveness of the work plan, assessment of risks, and appropriateness of the effort assigned to work packages and the resources overall.
- Capacity and role of each participant, and extent to which the consortium as a whole brings together the necessary expertise.

6. Call process

The Call process includes two stages: the pre-proposal stage (Stage 1) and the full proposal stage (Stage 2). **To be considered for selection, your pre-proposal must be submitted on time, complete and concise. Direct submission of a full proposal in Stage 2 is impossible.**

6.1. Pre-proposal stage – Stage 1

6.1.1 Submission of pre-proposals

A pre-proposal must be submitted by a Coordinator (see **Section 4.2** for the eligibility criteria and guidelines on project consortia) to a Call Module by **22 November 2023, 14:00 CET** on the CETPartnership Submission Platform, where the Coordinator must invite all the other Project Consortium Partners (the other Beneficiary Partners and possible Self-financed Partners). To submit the pre-proposal, every Project Consortium Partner invited by the Coordinator must accept the invitation and enter its information and budget on the Submission Platform, while possible irrelevant partners must have been removed.

The pre-proposal can be edited and re-submitted until the deadline. Every submitted version will replace the previous one, and the last version submitted by the deadline will be assessed and evaluated.

The pre-proposal must include a project description (max 10 pages using the mandatory pre-proposal templates available for download on the start page of the Submission Platform) and any supporting documents, where required. Text and page limits are set on the Submission Platform. See **Section 4.1** for the eligibility criteria and guidelines on submission. See **Section 4.2–4.9** for the eligibility criteria and guidelines on how to formulate the pre-proposal.

Please consider that some Funding Organisations require submission of additional information from applicable Project Consortium Partners. In this case, the Funding Organisations have own submission procedure such as deadlines, portals and templates. See respective national/regional requirements in **Annex B**.

6.1.2. Eligibility check of pre-proposals

The submitted pre-proposals will be assessed according to:

- Transnational eligibility criteria (see **Chapter 4**) by the Call Management.
- Call Module requirements (see **Chapter 8**) by TRIs.
- National/regional requirements (see **Annex B**) by the Funding Organisations. However, the final eligibility check may need to wait until Stage 2.

In Stage 1, the Funding Organisations deem Beneficiary Partners:

- Eligible for applying for funding in a full proposal
- Conditionally eligible, considered in the same way as eligible Beneficiary Partners except requested more information or requirements to be included in a full proposal
- Ineligible for applying for funding in a full proposal

In a similar manner, the TRIs deem pre-proposals:

- Eligible for applying for funding in a full proposal
- Conditionally eligible, considered in the same way as eligible pre-proposals except requested more information or requirements to be included in a full proposal
- Ineligible for applying for funding in a full proposal

Pre-proposals fulfilling all the transnational eligibility criteria and Call Module requirements will proceed to the next step.

A pre-proposal with (an) ineligible Beneficiary Partner(s) may also proceed to the next step on equal terms, if the Coordinator is deemed eligible or conditionally eligible and if the ineligible Beneficiary Partner(s) only cover(s) less than 25% of the total project efforts (measured in person months), despite the risk of failing to fulfil **TRANSNATIONAL ELIGIBILITY CRITERION 2**.

6.1.3. Evaluation of pre-proposals

In each Call Module, the evaluation of pre-proposals passing the former steps will be done according to the evaluation criteria described in **Chapter 5** and result in a ranking list. Each pre-proposal will be evaluated by at least three independent evaluators. In case of strong disagreement between individual evaluations, a panel meeting will be arranged to reach a consensus.

6.1.4. Selection of pre-proposals

Based on the ranking lists developed in the former step, the Funding Organisations will agree on a list of pre-proposals to be invited to Stage 2, while ensuring that the total funding requested by the invited pre-proposals is maximum four times the available budget for each Funding Organisation in each Call Module. Proposals scoring below the cut-off as described in **Chapter 5** will be excluded from the selection.

In case of budgetary constraints, pre-proposals scoring higher in the ranking lists will be prioritised, considering the following **core principles**:

- Maximisation of the total output in terms of funded projects.
- Maximisation of the number of countries/regions involved in the funded projects.
- Aiming for a similar success rate between the Call Modules.
- Reaching a good balance between the Call Modules regarding the output in terms of funded projects.
- Maximisation of the financial contribution by the EC obtained through the Joint Call 2023.

The outcome of Stage 1 will be notified by the Call Management to each Coordinator with reports on the eligibility check and, if applicable, the evaluation of the pre-proposals.

6.2. Full proposal stage – Stage 2

6.2.1. Submission of full proposal

A full proposal must be submitted by the Coordinator of each invited project consortium (see **Section 4.2** for the eligibility criteria and guidelines on project consortia) to the same Call Module by **27 March 2024, 14:00 CET** on the Submission Platform, in a similar manner to the pre-proposal, in collaboration with the other Project Consortium Partners (including Self-financed Partners). The difference from the

submission of the pre-proposal (**Subsection 6.1.1**) is:

- The full proposal must include a project description (max 30 pages instead of max 10 pages).
- Each Self-financed Partners must submit a Letter of Commitment.

Between the pre-proposal and the full proposal, no fundamental changes initiated by the project consortium alone will be accepted, except for minor ones in the project consortium, project budget, applied funding (see more information below) and project duration. Such minor changes must be communicated to all the Project Consortium Partners and the relevant Funding Organisation(s) before submission of the full proposal. Additionally, (a) written proof(s) of approval from the Funding Organisation(s) must be submitted to the Call Management (callmanagement@cetpartnership.eu) before the panel meeting described in **Section 6.2.3**.

The following changes in the project consortium can be allowed:

- To add (a) Self-financed Partner(s).
- To change (a) Beneficiary Partner(s) deemed ineligible in Stage 1 into (a) Self-financed Partner(s).
- To change (a) Beneficiary Partner(s) for (a) new Beneficiary partner(s) applying for funding from the same Funding Organisation.

If any Funding Organisation turns out to be undersubscribed in Stage 1²⁵, the following changes will also be allowed in the project consortium to widen the involvement of Funding Organisations:

- To change (an) ineligible Beneficiary Partner(s) for (another/other) Beneficiary Partner(s) applying for funding from any of the undersubscribed Funding Organisations.
- To add (a) new Beneficiary Partner(s) applying for funding from any of the undersubscribed Funding Organisations.

Changes in the project consortium can only be allowed if all the following conditions are met:

- The Coordinator stays the same.
- Addition/change of (a) Project Consortium Partner(s) is well motivated in relation to the overall project ambition and scope.
- Addition/change of (a) Project Consortium Partner(s) changes max 25% of the total project budget.

Please again consider that some Funding Organisations require submission of additional information from applicable Project Consortium Partners. In this case, the Funding Organisations have own submission procedure such as deadlines, portals and templates. See respective national/regional requirements in **Annex B**.

6.2.2. Eligibility check of full proposals

The submitted full proposals will be assessed for their eligibility in a similar manner to the pre-proposal. Full proposals fulfilling all the transnational eligibility criteria and Call Module requirements will proceed to the next step.

²⁵ Potential Funding Organisations will be found on the Submission Platform after Stage 1.

6.2.3. Evaluation of full proposals

In each Call Module, the evaluation of full proposals passing the former steps will be done according to the evaluation criteria described in **Chapter 5** and result in a ranking list. Each full proposal will be evaluated by at least three independent evaluators, who will then meet at a panel meeting to reach a consensus and write a report. The whole evaluation process will be overseen by an independent observer.

6.2.4. Selection of full proposals

The Funding Organisations will agree on a list of full proposals to be funded based on the ranking lists in the former step, the available budgets and the same core principles as in **Subsection 6.1.4**. Proposals scoring below the cut-off as described in **Chapter 5** will be excluded from the selection.

The outcome of Stage 2 will be notified by the Call Management to each Coordinator with reports on the eligibility check and, if applicable, the evaluation of the full proposals.

DRAFT

7. Project implementation

7.1. Funding arrangements and period

Funding arrangement will be made directly between Project Consortium Partners and their national/regional Funding Organisations. It is highly recommended that all Partners in a project consortium synchronise their project start and end dates, even though their national/regional funding arrangements can be desynchronised. The latest start date for all Project Consortium Partners is 15 December 2024.

According to **Section 4.3**, projects funded by the Call must start before 15 December 2024 (**TRANSNATIONAL ELIGIBILITY CRITERION 7**) and finish in 36 months (**TRANSNATIONAL ELIGIBILITY CRITERION 8**). Specific National/regional requirements may apply regarding the project duration (see **Annex B**).

7.2. Consortium Agreement (CA)

Each project consortium must have a signed Consortium Agreement (CA) between all the Project Consortium Partners, including intellectual property rights (IPR) issues. It is recommended to have it already at the project start or by 6 months after the project start using the Development of a Simplified Consortium Agreement (DESCA)²⁶ template. However, a project consortium with Project Consortium Partners outside Europe may need an adapted CA.

7.3. Gender Equality Plans

The Beneficiary Partners must follow HE Guidance on Gender Equality Plans (GEPs)²⁷. It means that public bodies as well as public and private higher education establishments and research organisations established in EU Member States and Associated Countries must have a GEP.

7.4. Changes in projects

Any substantial changes in an ongoing project must be reported to and approved by relevant Funding Organisations and the Call Management. Such changes may affect the funding from the CETPartnership.

7.5. Reporting and dissemination

The Coordinator must submit annual reports and a final report to the CETPartnership as well as other potential information needed by the EC. In addition, each project is expected to have a webpage, to prepare popular scientific summaries and to actively participate in the CETPartnership Knowledge Community (see **Section 1.3** and **Annex A**) for increased knowledge sharing and dissemination of results.

Specific National/regional requirements may apply regarding the reporting and dissemination.

²⁶ <https://www.desca-agreement.eu/desca-model-consortium-agreement/>

²⁷ <https://op.europa.eu/en/publication-detail/-/publication/ffcb06c3-200a-11ec-bd8e-01aa75ed71a1/language-en/format-PDF/source-232129669>

8. Call Modules

To cover different topics and RDI approaches, the Call is structured into 12 **Call Modules**, aimed at different energy technologies and/or systems (see Table 8.1). The Call Modules address different research-oriented approach (**ROA**) and innovation-oriented approach (**IOA**) (see **Section 4.4**) on different Technology Readiness Levels (TRLs)²⁸ (see **Section 4.5**) and are thus complementing and completing each other.

TABLE 8.1. CALL MODULES

No.	Title	Contact
CM2023-01	Direct current (DC) technologies for power networks	TRI1@cetpartnership.eu
CM2023-02	Energy system flexibility: renewables production, storage and system integration	TRI1@cetpartnership.eu TRI2@cetpartnership.eu
CM2023-03A CM2023-03B	Advanced renewable energy technologies for power production	TRI2@cetpartnership.eu
CM2023-04	Carbon capture, utilisation, and storage (CCUS)	TRI3@cetpartnership.eu
CM2023-05	Hydrogen and renewable fuels	TRI3@cetpartnership.eu
CM2023-06	Heating and cooling technologies	TRI4@cetpartnership.eu
CM2023-07	Geothermal energy technologies	TRI4@cetpartnership.eu
CM2023-08	Integrated regional energy systems	TRI5@cetpartnership.eu
CM2023-09	Integrated industrial energy systems	TRI6@cetpartnership.eu
CM2023-10A CM2023-10B	Clean energy integration in the built environment	TRI7@cetpartnership.eu

In addition to the eligibility criteria and guidelines described in Chapter 4, specific Call Module requirements may apply. For such requirements, see the following in respective Call Modules in this chapter:

- **Project consortia** regarding the project consortia
- **Project duration and budget** regarding the project duration and budget
- **Target RDI approaches/TRLs** regarding the RDI approaches and TRLs
- **Objectives, Scope, Target topics, Expected impact, Target RDI approaches/TRLs and Project consortia** regarding the cross-cutting dimensions

²⁸ Definition in Horizon Europe Work Programme 2023-2024 13. General Annexes, https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-13-general-annexes_horizon-2023-2024_en.pdf

CM2023-01 Direct current (DC) technologies for power networks

Objectives

TRI1²⁹ implements the CETPartnership SRIA³⁰ Challenge 1, that is focused on developing the “Optimised, integrated European net-zero emission energy system”, where the energy networks (i.e. electricity, gas, hydrogen, water, heating and cooling, mobility and their integrated and coordinated functioning etc.) play a significant role.

To meet the European Union (EU) and Member States’ climate targets for 2030 and 2050, it is not only necessary to accelerate the expansion of renewable energy sources (RES), but also to integrate RES more efficiently into the energy system.

RES integration into the energy system will require a fundamental change in infrastructure, implying significant investments in grids and use of different and new technologies in the grids. Direct current (DC) technologies can have a leading role in this transformation thanks to their flexibility, efficiency and sustainability. High voltage DC (HVDC) is essential for offshore generation and for the integration of energy islands (both onshore and offshore), while medium/low voltage DC (MVDC and LVDC) and hybrid networks (AC and DC) can foster direct RES integration at local level and sector coupling. Microgrids represent an outstanding solution to foster resilience as they enable the integration of all types of local resources (generation, storage, conversion, and load). MV/LVDC solutions can be of interest in this framework, observing that several of these elements are designed to operate in DC,

While both transmission and distribution grids are currently predominantly AC, DC grids are becoming increasingly important. Especially for long transmission distances, the use of HVDC is often advantageous, as their specific transport capacity is higher, there are lower losses over long distances, and compensation techniques are not required.

HVDC is therefore also important for connecting offshore wind farms to continental electricity grids and for the integration of “energy islands”, a system concept currently being promoted by several Member States. In particular, the offshore wind expansion plans of the countries bordering the North Sea and the new energy island concept are challenging to integrate into the existing grids with current solutions, so that in addition to the necessary investments, there is also a high demand for research.

Moreover, there is a clear trend towards making use of MVDC networks and MVDC grids/microgrids thanks to the advancements in the power electronics area. For example, large RES can be easily connected to the MVDC networks, and DC loads such as energy storage or electric vehicles are increasingly appearing. In addition, existing AC grids can be effectively coupled using DC. MVDC networks and microgrids, which have different characteristics and applications from HVDC networks, are still in their infancy in terms of research.

In addition, LVDC networks are getting attention as well. In particular, LVDC can be used in microgrids at industrial, building, street and district level to improve efficiency and reduce losses.

²⁹ <https://cetpartnership.eu/tri/1>

³⁰ https://cetpartnership.eu/sites/default/files/documentation/CETP%20SRIA_v1.0_endorsed_compressed_0.pdf

This Call Module addresses the main challenges of DC technologies at low, medium and high voltage level for effective integration into the energy infrastructure of high shares of RES, including energy islands. The dynamic response of power systems with high shares of renewables, characterised by the widespread use of non-rotating generators is more dependent on complex fast-responding power electronic devices. Furthermore, meshed DC grids are expected to proliferate at all voltage levels as well as hybrid AC/DC transmission and distribution networks. In this context, even the higher voltage grids evolve towards multi-terminal, multi-vendor and meshed DC configurations. Therefore, new and advanced control and operation principles are required for a secure and stable grid operation supported by a higher level of observability, covering all voltage levels and new types of dynamics (e.g. faster dynamics).

In addition, the DC grids must be integrated into the existing grid infrastructures, whereby cost-efficient solutions are essential. Especially the integration of energy islands into the onshore grids requires not only transnational planning but also the consideration of market aspects, e.g. connection to shore, technology used and design of pricing zones. Furthermore, the costs of the different technologies on all voltage levels must be taken into consideration to enable effective hybrid AC/DC grid planning. Not only should optimal solutions be determined in terms of a cost-benefit analysis, but the solutions should also be designed for the long term.

TRI1, in continuity with previous year, keeps its work direction in the field of integrated energy system according to SET Plan Implementation Working Group IWG4 ‘energy systems’ and the IWG ‘HVDC and DC-Technologies’, to the targets set by EU policies in the last years and to technology R&I roadmaps. Particularly, this Call Module fits into ETIP SNET, R&I Implementation Plan 2022–2025³¹ (High Level Use Cases 4, 6 and 7).

Scope

This Call Module is meant to foster projects to develop, test and demonstrate enabling and supporting tools in the fields of:

- HVDC, MVDC and LVDC development and deployment
- meshed multi-terminal AC/DC grids
- energy island integration

The scope can be divided into three main areas the projects can focus on:

1. Planning and markets
 - Planning of meshed energy islands and their integration in onshore grids, e.g. location, capacity of onshore grids, size, technologies, impact of onshore grid/market
 - Analysis of sustainability and environmental impact of DC grids and energy islands
 - Coordinated planning of hybrid AC/DC grids including DC microgrids
 - Simulation of energy island integration and market related aspects, e.g. design of offshore bidding zones
2. Operation, control and protection
 - Grid operation and control principles for LVDC, MVDC and multi-terminal HVDC networks, for hybrid transmission and hybrid distribution AC/DC grids
 - Analysis and development of new energy management, voltage and power level management solutions including provision of flexibility

³¹ <https://op.europa.eu/en/publication-detail/-/publication/53e747cd-9f57-11ec-83e1-01aa75ed71a1>

- Investigations and simulations of the dynamics of multi-terminal DC networks connected to AC grids
 - Develop, test and validate protection concepts for DC and hybrid grids
 - New generation of grid-connected inverters and parallel operation, lifetime and reliability of converters (different vendor, different topologies, considering energy storage applications)
 - Components, operation and control of MVDC and LVDC microgrids
 - Development of reliable communication and integration of DC grids in SCADA systems
 - LVDC applications for distributed RES/EV integration and industrial processes
 - Energy management of LVDC installations and compatibility with existing infrastructure, considering aspects such as scalability and parallel operation of power-supply units, standards for interfaces of LVDC-systems to existing electrical infrastructure
 - Investigation of the possibility to convert AC infrastructure in different contexts into MV-/LVDC
 - Implementation of earthing schemes
 - Investigation of the magnitude of stray currents in typical installations and the subsequent corrosion in a multidisciplinary approach.
3. Verification, test and maintenance
- Testing and verification methods and concepts for scaling
 - Standardised validation tests for de-risking interoperability issues
 - New HiL testing concepts
 - Standardised test procedures for DC grid protection equipment
 - Analysis of possible trade-offs in performance, ambient condition impact, maintenance, reliability, dimensioning, testing procedures, etc.
 - Improved tools for remote monitoring and maintenance of equipment
 - Digital twins for condition monitoring and improved maintenance
 - Definition of protection schemes and components for a variety of system architectures
 - Investigation of suitability of DC fuses for use cases with very small-time constants
 - Further investigation of breaker-less protection concepts in zones with limited fault energy

Projects must provide results in at least one of these three areas of the Call Module scope.

By fostering projects focusing on these areas, this Call Module aims to respond to the main R&I gaps and challenges underlined by IWG HVDC³², IWG 4³³, ENTSO-e³⁴, ETIP SNET³⁵ and ETIPWind³⁶ in the framework of SET Plan:

- HVDC and MVDC technology development
- interoperability
- new solutions for DC breakers
- energy management solutions
- voltage and power level management
- distribution digital DC/hybrid converter/transformer

³² https://setis.ec.europa.eu/implementing-actions/high-voltage-direct-current-hvdc-direct-current-dc-technologies_en

³³ https://setis.ec.europa.eu/implementing-actions/energy-systems_en

³⁴ <https://www.entsoe.eu/>

³⁵ <https://smart-networks-energy-transition.ec.europa.eu/>

³⁶ <https://etipwind.eu/>

- optimal design and operation concepts of hybrid grids (HVDC & HVAC; MVDC & MVAC)
- clear understanding and simulations of the dynamics of a power grid with high penetration of power electronics
- new generation of grid-connected inverters able to provide grid services in a flexible way and to commute
- grid operation and control principles for multi-terminal HVDC and MVDC networks and for hybrid AC/DC networks
- intelligent hybrid distribution substation

Exclusive analysis of materials, semiconductors and their design are not within the scope of this Call Module, but can be considered to an appropriate extent within a larger project.

Expected impact

Supported projects are expected to deliver results that have a significant impact on promoting the deployment of new and cost-efficient technologies. This Call Module looks at results helping to reduce the time to market for technologies much needed for the development of multi-terminal and multi-vendor hybrid networks, integrating LVDC, MVDC, HVDC and energy islands, with a significant contribution to the integration in the overall energy system.

Expected impacts:

- availability of validated solutions for control, operation and protection of DC and hybrid grids: shortening market uptake and cost reduction
- fostering European leadership in solutions and technologies linked with operation and control of DC networks
- acceleration of production of standards to ensure interoperability for multi-vendor applications enhancing technological market efficiency and cost reduction
- fostering European leadership in testing and validation of DC solutions and their related control and operation
- reduction of costs for maintenance and operation linked with the development of advanced monitoring and diagnostic techniques for DC applications
- enabling the concept of energy islands both onshore and offshore to optimise the integration of RES in a multi-vector energy system
- reducing the environmental impact of transmission and distribution grids and their components – e.g. HVDC for offshore wind integration or DC microgrids
- enabling cross-border markets, e.g. bidding zones design for North Sea or Baltic Sea, and reduced grid fees due to efficient transmission and distribution

Target RDI approaches/TRLs

The Call Module aims to support projects increasing the TRL moderately, i.e. showing a TRL increase of 1–2 from start to finish.

Project consortia

The concrete later use represents an important aspect of this Call Module, so that the consortia should have significant industry participation. The need-owners should be involved as Project Consortium

Partners in the project (e.g. wind park operator).

This Call Module expects at least two of the following stakeholders to be Beneficiary Partners of the projects:

- operators of offshore wind farms / energy islands
- infrastructure or grid operators, e.g. TSO, DSO
- industry and SMEs in the fields of components, systems and devices for energy systems as well as software (services)
- universities and research institutes

Further partners (Associated Partners) are welcome, e.g. (European) standardisation organisations, national & local authorities, etc.

Attention should be paid to a balanced allocation of work between users and developers.

The opportunity for projects to work on existing infrastructures would be considered positively. If possible, project consortia should include partners that can provide access to infrastructures to develop and test solutions that can be directly applied (e.g. supporting activities and tools for verification, validation, testing and study of technologies and their integration; working with test facilities and hardware in the loop; support, control and measurement tools; etc.).

Project duration and budget

As for project duration, see **Section 4.3**.

A budget of EUR10 million for the Call Module is envisaged. 2 – 3 projects shall be funded with EUR 2 – 4 million each. Projects addressing planning and markets are expected to be funded with EUR 1 – 2 million each.

CM2023-02 Energy system flexibility: renewables production, storage and system integration

Objectives

Through this joint Call Module, the CETPartnership [TRI1](#)³⁷ and [TRI2](#)³⁸ and the Mission Innovation (MI) Green Powered Future Mission (GPFM) are establishing an effective collaboration towards the green transition of the energy system.

The [MI GPFM](#)³⁹ aims to demonstrate that by 2030, power systems in different geographies and climates can effectively integrate up to 100% variable renewable energies, like wind and solar, in their generation mix, and maintain a cost-efficient, secure and resilient system.

This joint Call Module is intended to increase opportunities for international cooperation and represents the implementation of the GPFM Flagship Project 2 (FP2) “Multilateral Research Programme” to take forward a selection of the identified Innovation Priorities (IPs) for the power system decarbonisation and transformation. FP2 was launched by the GPFM at the Global Clean Energy Action Forum held in Pittsburgh (September 2022) as part of the [GPFM Action Plan 2022–2024](#)⁴⁰.

Scope

This joint Call Module aims to address key aspects of the clean energy transition ranging from the integration of renewable energy sources into the power grids, considering storage as a possible solution to deal with their intermittent nature, to broad technological and market aspects as well as approaches towards system integration. Moreover, digitalisation and standardisation, being key enablers for the deployment of innovative system flexibility solutions, need to be duly considered by the submitted proposed projects.

The R&I Themes and IPs addressed by this Call Module are reported here below and have been selected with the help of a task force set up within the GPFM and by joint discussions between the GPFM and the CETPartnership. The challenges addressed by the Call Module are well aligned with the [CETPartnership SRIA](#)⁴¹: funded projects are therefore expected to contribute to reach the targets of both initiatives.

Funded projects shall address one or more of the following main **R&I Themes**:

1. Large-scale renewable generation and system flexibility and reliability
2. Energy storage technologies and systems for flexibility services
3. System integration and flexible operations
4. Innovative flexibility sources and flexibility markets
5. Energy data management and security

³⁷ <https://cetpartnership.eu/tri/1>

³⁸ <https://cetpartnership.eu/tri/2>

³⁹ <https://explore.mission-innovation.net/mission/green-powered-future/>

⁴⁰ <http://mission-innovation.net/wp-content/uploads/2022/09/Green-Powered-Future-Mission-Action-Plan-2022-2024.pdf>

⁴¹ https://cetpartnership.eu/sites/default/files/documentation/CETP%20SRIA_v1.0_endorsed_compressed_0.pdf

More in detail, funded projects shall address one or more of the following identified IPs⁴²:

1. Large-scale renewable energy generation for improving system reliability & stability (GPFM IP 1.3.2)
2. Variable renewable energy flexibility provision & contribution to generation capacity (GPFM IP 2.1.1)
3. Innovation in energy storage technologies (GPFM IP 1.5.3)
4. Utility scale storage systems for innovative flexibility services (GPFM IP 2.4.3)
5. System stability assessment considering high VRE penetration (GPFM IP 2.3.1)
6. Enhanced TSO-DSO coordination platform for flexibility markets optimisation (GPFM IP 2.3.2)
7. Flexibility markets for innovative ancillary services by VRE and storage (GPFM IP 2.7.1)
8. Unlocking commercial and residential buildings flexibility potential (GPFM IP 2.5.2)
9. Connected data platforms for enhanced forecasting and flexible operation (GPFM IP 3.3.2)
10. Standardisation of devices and control platforms (GPFM IP 3.1.2)
11. Identify priority dataset for system security (GPFM IP 3.2.2)

Expected impact

This joint Call Module is intended to concentrate efforts and financial resources to accelerate the deployment of key innovation thus enabling the uptake of clean energy solutions in the near future.

The Call Module mainly focuses on **research and development**, while demonstration and implementation are considered as subordinate. Nevertheless, it is expected to possibly involve **industry**, bringing in expertise, knowledge, and know-how for the implementation of innovative and breakthrough solutions.

The Call Module mainly focuses on **transnationality**, as it expects to engage with GPFM country member organisations, among which are included extra-European countries (countries outside the EU and not associated to HE). Projects with partners outside Europe are expected to foster the CETPartnership approach worldwide, also contributing to link the GPFM Internet-based platform to the CETPartnership knowledge community.

Target RDI approaches/TRLs

The Call Module aims to support projects starting from TRL ≥ 3 and reaching TRL 5–6.

Project consortia

This joint Call Module deviates from the standard requirements regarding the consortium composition since it is devoted also to extra-European countries participation (countries outside the EU and not associated to HE).

The proper involvement in the consortia of Research Performing Organisations (RPO) and private sector actors such as system operators, SMEs, spin-off companies, will be key to submit sound project proposals and to properly address some of the selected IP. Moreover, projects should be highly

⁴² See the GPFM Action Plan 2022–2024, <https://explore.mission-innovation.net/wp-content/uploads/2022/09/Green-Powered-Future-Mission-Action-Plan-2022-2024-1.pdf>

innovative and should preferably be designed building on top of existing initiatives or assets and propose replicable and scalable solutions.

Project duration and budget

As for project duration, see **Section 4.3**.

The Call Module aims to support projects applying for funding in the Call in the range of (but not limited to) EUR 0.5 – 1.5 million.

DRAFT

CM2023-03A/03B Advanced renewable energy (RE) technologies for power production

Objectives

The Call Modules **CM2023-03A/03B Advanced renewable energy (RE) technologies for power production** build on the CETPartnership SRIA, the Input Papers and the SET Plan Implementation Plans for the Actions 1 & 2 ‘Global Leadership in Renewables’, to deliver performing RE technologies integrated in the energy system with increased circularity and a more sustainable life cycle.

The objective of the Call Modules is to support the development, scale up and market uptake of enhanced RE technologies contributing to zero-emission power production, in line with the Green Deal and the EU’s energy policy and decarbonisation targets. In particular, the Call Modules **support projects aiming at increasing the overall energy conversion efficiency and lowering RE technologies’ cost**. The EU SET Plan performance and cost targets for the renewable energy technologies in the scope of TRI2⁴³ are a reference for these Call Modules.

The Call Modules contribute to the relevant SET Plan Implementation Plans objectives (and namely the IPs on CSP/STE; Ocean Energy; PV; Wind)⁴⁴, complementing HE calls in order to have a balanced portfolio of RE technologies for power production at different stages of TRL.

CM2023-03A calls for ROA (Research-Oriented Approach) projects, and **CM2023-03B** calls for IOA (Innovation-Oriented Approach) projects (see **Section 4.4** for definition of ROA and IOA). Projects can apply for either ROA or IOA, according to the target TRL.

Scope

Zero-emission power technologies are a cornerstone of the global and European sustainable energy system. Solar (photovoltaic-PV based, thermal and Concentrating Solar Power-STE/CSP), onshore and offshore wind, ocean energy, bioenergy with negative CO₂ emissions and their integration are key for transitioning the energy system. The electrification of end-use sectors, the integration of RE sources into the energy system, further reduction of cost, enhanced flexibility and diversification are needed. A massive renewable energy technologies rollout shall be accompanied by a sustainable integration into living and natural environment, sustainability and circularity in all parts of the European and global value chains.

The Call Modules are open to all the broad portfolio of RE zero-emission power technologies in TRI2’s scope, but specific focus is on technologies contributing to power production such as onshore and offshore wind, ocean energy (tidal, wave, OTEC, osmotic energy etc.) and other offshore renewables, solar energy (PV based technology, including PVT, PVH and STE-CSP), bioenergy for power generation (with negative carbon emissions). Please note that bioenergy applications dedicated to fuel production are not in TRI2’s in scope but are considered in TRI3’s Call Module (**CM2023-05**).

⁴³ <https://cetpartnership.eu/tri/2>

⁴⁴ CSP/STE: Initiative for Global Leadership in Concentrated Solar Thermal Technologies (Updated Implementation Plan February 2023); Ocean Energy: Ocean Energy - Implementation Plan (2021); Solar photovoltaics: PV Implementation Plan (2017 - under revision); Wind Energy: 2nd SET Plan Implementation Plan for offshore wind (March 2022). See: https://setis.ec.europa.eu/implementing-actions/set-plan-documents_en#implementation-plans

Target topics

The present Call Module aims to respond to the main RDI gaps and challenges underlined by the relevant SET Plan IWGs: IWG CSP-STE, IWG Ocean Energy; IWG PV and IWG Wind⁴⁵.

Following consultation with stakeholders, the following RDI areas have been identified as priority. The list is not prescriptive and other topics might be considered, as long as they demonstrate contribution to the objectives of the Call Modules and the development of the relevant RE sector.

Bioenergy for power generation

- High efficiency biomass (co)generation of power with improved performance and higher share of power production ratio, using residues and wastes as feedstocks, and with negative carbon emission
- Integrated CHP systems enhancing annual total efficiency and power capacity factor and negative carbon emission

Concentrated solar power (CSP) / solar thermal energy (STE)

- **Line-focus solar power plants technology:** Component development, process innovation and cost optimisation for molten salts systems; Solar collector fields with silicone oil as heat transfer fluid (HTF)
- **Central Receiver** power plants technology (concepts, materials and components): optimisation of central receiver molten-salt technology; Solar tower with particle receiver technology
- **Turbo-machinery** developed for specific conditions of solar thermal power plants: expansion turbine technologies for advanced CSP power blocks or supercritical CO₂ cycles
- **Cross-cutting issues:** Digitalisation of CSP plants; Innovative coatings for CSP mirrors

Ocean energy

- **Dry-testing** of power take-off for wave energy devices to debug, improve, stabilise, fine-tune and optimise wave energy devices before offshore operations
- **Tidal blades:** Improving the survivability and efficiency of tidal blades to enhance performance and reliability of the device
- **Connection systems:** Reduce the cost of connection and cabling systems, as well as maintenance requirements and costs

Offshore renewables (marine renewables, floating wind/PV, etc.)

- **New materials** or novel applications of existing materials for moorings, foundations and components: Materials with improved fatigue, damping, stiffness, bio-fouling management or other cost-reducing characteristics
- **Moorings and connections:** Improved moorings, foundations, connections and cabling systems; Dynamic cable repair solutions

⁴⁵ https://setis.ec.europa.eu/implementing-actions_en

- **O&M:** innovative solutions to reduce costs of operations and maintenance
- **Site-specific marine observation, modelling and forecasting:** marine / meteorological data to improve performance, reliability, availability of offshore renewables through better design and efficient operations

Solar photovoltaics

- **Performance Enhancement and Cost Reduction** through Advanced PV Technologies: Perovskite / Silicon Tandem-Solar cells and modules / Thin film cells
- **Lifetime, Reliability and Sustainability,** advanced PV technologies, manufacturing and applications: Low environmental impact materials, processes, products
- **Digitalisation for O&M:** advanced data analytics, digital twin of assets and components, predictive maintenance
- **New Applications through Integration of PV:** Agrovoltaic and landscape integration; Floating PV; IIPV-Infrastructure Integrated PV; Low power PV

Wind energy (offshore and onshore)

- **Next generation of wind turbine technology:** cost-efficient, energy-efficient, low environmental impact, scalable wind energy converters and turbines
- **Atmospheric modelling:** Improved understanding of atmospheric and wind power plant flow physics; Predicting environmental parameters
- **Digital twins** for turbine and for optimised wind energy applications
- **O&M:** solutions/digital solutions for wind energy operation, maintenance & installation
- **Landscape integration** of wind energy in the natural and social environment

Hybrid-RES solutions

- **Site integration optimisation:** PV+CSP; PV+Wind, CSP-Wind, Ocean-Wind, etc.
- **Optimising Generation Capacities with storage:** Optimise RE power production, site and technology integration with energy storage (projects focusing on storage integration for flexibility and innovation in energy storage technologies shall apply under Call Module CM2023-02)
- **Hybrid systems:** Combined electricity generation with heat or other energy carriers in hybrid systems (PVT, PV-Hydrogen, CSP-ST)

Expected impact

Projects shall address one or more of the following outcomes:

- Increase the **energy conversion efficiency**, contributing to zero-emission power production
- Increase **technology performance** (with reference to SET Plan Implementation Plans⁴⁶) and/or lifetime
- Develop **innovative technologies and components**, ensuring higher efficiency in the energy and power production

⁴⁶ https://setis.ec.europa.eu/implementing-actions/set-plan-documents_en#implementation-plans

- Decrease **investment cost and LCOE** and/or improve the overall economics of the technology
- Demonstrate the **feasibility of scaling up**
- Demonstrate the **technology in different geophysical conditions** or in different weather conditions
- Reduce **environmental impact** (e. g. land use, effects on biodiversity and animal life) or significantly improve multiple use of occupied land surface / or maritime space
- Minimise the use of **critical raw materials** (CRM) and apply circularity-by-design approaches

Target RDI approaches/TRLs

Both research-oriented approach (ROA) and innovation-oriented approach (IOA) projects are equally relevant and will be ranked in **CM2023-03A** and **CM2023-03B** respectively.

CM2023-03A covers ROA projects (TRL 3–5) which will increase the efficiency of the technology and reach TRL 4 or above.

CM2023-03B covers IOA projects (TRL 5–7/8) which will make relevant progress towards the demonstration of technology and reach TRL 6 or above.

Project consortia

The Call Modules target consortia comprising complementary Research Performing Organisations (Universities, Research and Technology Organisations) and/or industry (SME, spin-offs; large companies, technology providers etc.).

The participation of industry associations and other relevant stakeholders, as well as regional/local governments, NGOs and/or Consumer Associations in Advisory Boards or as Project Consortium Partners is an asset.

Projects applying as IOA (**CM2023-03B**) shall comprise industry partners (SMEs, Spin-offs, large companies and in general any industrial up-taker) in the project consortium.

Project budget and duration

As for project duration, see **Section 4.3**.

The Call Module aims to support projects in the range of (but not limited to):

- EUR 1–2 million budget for **CM2023-03A** (ROA)
- EUR 2.5–5 million budget for **CM2023-03B** (IOA)

CM2023-04 Carbon capture, utilisation, and storage (CCUS)

Objectives

The Call Module on CCU/CCS is based on the previous ERA-Net ACT initiative⁴⁷ with the aim to facilitate the emergence of CO₂ Capture, Utilisation and Storage (CCUS) technologies via funding of transnational projects. It aims at facilitating the emergence of CCU and CCS by accelerating and maturing these CCU/CCS technologies through targeted financing of innovation and research activities.

The term CCUS refers to all areas of the CCU and CCS chains. It encompasses a wide spectrum of technologies to capture CO₂ from point sources or directly from the air and either store it in porous geological formations that are typically located several kilometres under the earth's surface, onshore or offshore (CCS), or use the CO₂ to produce valuable products like fuels or energy, chemicals, and other materials (CCU). Under this Call, CCU does not include the use of CO₂ as a non-reactive working fluid, unless it is combined with other renewable systems (such as geothermal) to constitute a CCUS system.

The CCU/CCS Call Module intends to fund projects that aim to accelerate CCUS technologies in support of global efforts to reduce CO₂ emissions by more than 50 percent by 2030 compared to 1990 and further efforts for climate neutrality.

The CCU/CCS Call Module is seeking innovative projects that range from smaller research projects to new or major expansions/upgrades of existing pilot and demonstration facility sites or projects.

Scope

Selected projects will support the emergence of CCU/CCS primarily in the industrial sectors and the energy sector.

The ambition of the Call Module is to select projects that have the potential to accelerate the time to market for CCU/CCS technologies. This will require cost-shared participation from industries in research and innovation activities, especially in energy intensive and heavy industry sectors, which may benefit strongly from implementing CCU/CCS technologies.

Projects must address one or several of the research and innovation activities described by the SET Plan IWG 9⁴⁸ and the Mission Innovation⁴⁹, with special emphasis on the following topics:

- CO₂ capture from energy intensive or heavy industry (waste to energy, cement, steel, other metals, etc.), power, maritime transport, hydrogen produced from natural gas, and storage-based CO₂ removal (CDR).
- Advancing lower cost CO₂ capture technologies that can effectively remove 95–100% of CO₂ from flue gases with dilute CO₂ concentrations.
- CO₂-storage sites, including elements that are needed for characterisation and management of large-scale permanent storage of CO₂, e.g., reservoir integrity, monitoring, capacity

⁴⁷ ACT- Accelerating CCS technologies, <http://www.act-ccs.eu/>

⁴⁸ CCUS Roadmap to 2030, https://www.ccus-setplan.eu/wp-content/uploads/2021/11/CCUS-SET-Plan_CCUS-Roadmap-2030.pdf

⁴⁹ <https://www.energy.gov/fecm/articles/accelerating-breakthrough-innovation-carbon-capture-utilization-and-storage>

estimation, modelling.

- Enabling CCUS technologies that industry views as high priority.
- Transport and injection of CO₂ (pipelines, ships, other non-pipeline transport and inter-modal options, monitoring and metering within CO₂ networks, temporary storage, well integrity and well technology).
- Reuse of existing energy assets for CCUS (e.g. pipeline repurposing).
- Negative emission technologies (NETs), Carbon Dioxide Removal (CDR) technologies such as Direct Air Capture technologies (DAC) with storage or use of CO₂, Bioenergy with CCS (BECCS), and Biomass Carbon Removal and Storage (BiCRS).

Projects focusing on developing new pilot and demonstration facilities are required to illustrate the potential for upscaling to industrial size either in a demo phase or early commercial phase.

Proposals must address at least one of the following:

- Improve the cost-efficiency and energy-efficiency along the value chain (scale up, storage at basin scale, efficiency, digital tools, effective collaboration among the stakeholders).
- Faster scale up of CCU/CCS technologies and at lower risk (design, demonstrations, development of legal framework, measures that strengthen the innovation system, knowledge sharing from full-scale operations, Integration into the energy-system etc.).
- Develop lower cost solutions for efficient capture of CO₂ from hydrogen produced from natural gas, and new technologies for processing, shipping, transport, and storage of hydrogen.
- Design and manufacturing of new materials that can make CCU/CCS more affordable.
- CCU/CCS market and business case development.
- Minimising or avoiding adverse impacts on human health and the environment throughout the CCU/CCS life cycle, including the development of circular economy strategies.
- Strengthen public perception of CCU/CCS through education, information sharing, and community engagement.
- Develop robust life-cycle assessment (LCA) and techno-economic analysis (TEA) for full CCU/CCS-value chains and life cycles. Alternatively, a more complex sustainability assessment can be developed addressing social science and humanities (SSH) disciplines (e.g. sociology, social psychology, economics).
- Develop net negative CO₂ emission solutions, such as direct air carbon capture and storage (DACCS) or Biomass Carbon Removal and Storage (BiCRS).

In addition to proposing technological solutions, proposals must also address the environmental, social, and economic implications that might impact industry adoption of the proposed technology. Proposals for only environmental, social, and economic implications of existing and commercial-ready technologies are not eligible for funding.

Expected impact

Funded projects will have a significant contribution to the green transition by accelerating development and deployment of CCUS technologies.

All projects must advance the state-of-the art for CCUS technologies and contribute new knowledge and new competence that brings CCUS closer to commercialisation.

The selected projects will address at least one of the following:

- lead to CO₂ capture at industrial-scale by early 2030s and CO₂ storage at mega ton scale also by early 2030s
- pave way for deployment of large-scale infrastructure for CO₂ capture from multiple sources, cross-border CO₂ transport, and CO₂ storage of tens of million tons CO₂ annually by mid 2030s
- be a bridge to implementation of CO₂ utilisation projects at industrial scale by early 2030s that have a sustainable and significant effect on reducing CO₂ emissions
- pave way for net zero or negative CO₂ emission technologies being deployed at industrial scale by mid 2030s

Target RDI approaches/TRLs

The Call Module aims to support projects reaching TRL 5 or above. However, activities at lower TRLs may be included if they contribute to the higher TRL goal of the overall project.

The acceleration of CCU/CCS technology deployment also depends on costs, markets and supporting frameworks. The Australian Renewable Energy Agency (ARENA) has developed and applied the concept of a Commercial Readiness Index (CRI) as shown in the figure below. The CRI casts technologies in terms of their commercial value proposition and ability to obtain financing for deployment.

Proposals must illustrate how their projects will help accelerate the time to market of affordable, cost-effective, low environmental impact and resource efficient CCU/CCS technologies. References to CRI and TRL should be included in proposals.

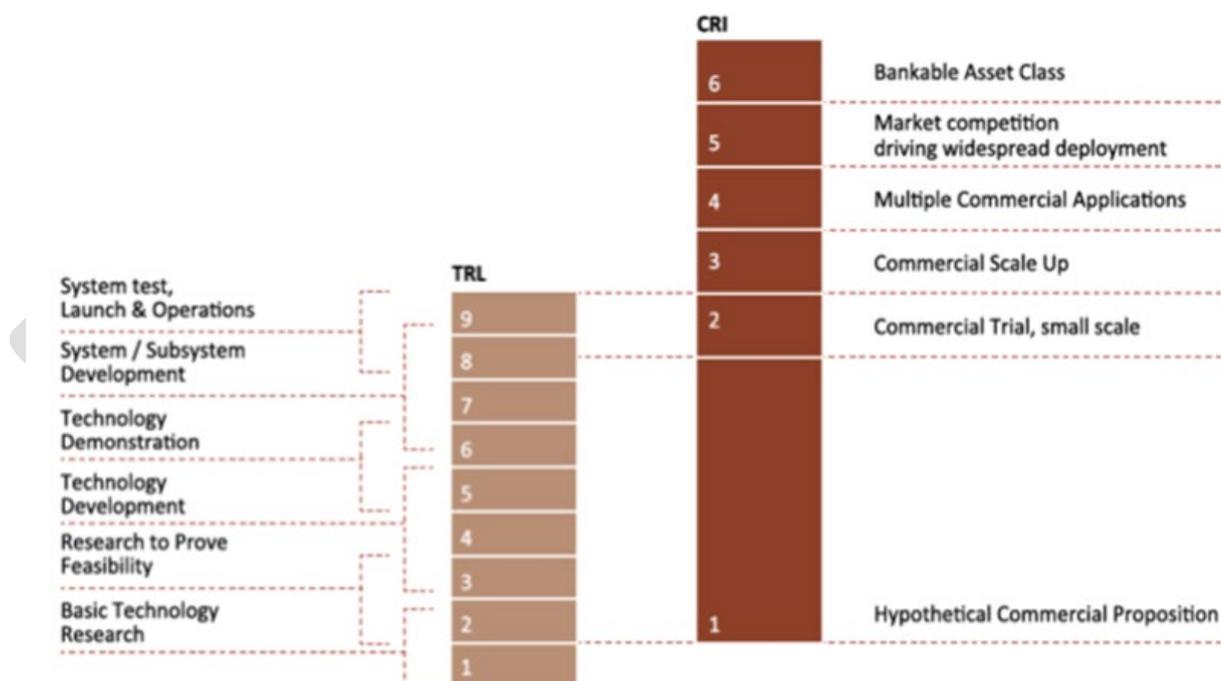


FIGURE 8.1. TECHNOLOGY READINESS LEVEL (TRL) AND THE COMMERCIAL READINESS INDEX (CRI)

Project consortia

Project consortia may consist of partners from universities, companies, industry organisations, local/regional governments, research organisations and NGOs. Consortia must demonstrate the interest of industry partner(s) by actively involving them in the project as Project Consortium Partners.

Access to top class research infrastructure is key for reaching the objectives of this Call Module. Proposals should, if relevant, seek to maximise synergies with existing infrastructures, for example ECCSEL⁵⁰, members of the International Test Center Network⁵¹, the Hontomin Technology Development Plant (TDP)⁵² in Spain, and the Alberta Carbon Conversion Technology Centre (ACCTC)⁵³.

Project duration and budget

Proposals must have a project duration between one and three years.

As for project budget, see **Section 4.3**.

⁵⁰ European Research Infrastructure for CO2 Capture, Utilisation, Transport and Storage (CCUS), <https://www.eccsel.org/>

⁵¹ <https://itcn-global.org/>

⁵² <http://www.enos-project.eu/sites/operational-storage-field-site/hontomin/>

⁵³ <https://innotechalberta.ca/facilities/alberta-carbon-conversion-technology-centre/>

CM2023-05 Hydrogen and renewable fuels

Objectives

The objective of the Call Module is to facilitate the development and adoption of technologies for effective production, transport, storage and end-use of hydrogen and renewable fuels, including security aspects.

The ambition of the Call Module is to accelerate the time to market for hydrogen and renewable fuel technologies. This will require industrial involvement in research and innovation activities.

The Call Module seeks to finance innovative projects, which can contribute, support, and provide results to future or already existing pilot and demonstration installations.

It is noted that at national level there might be specific goals within the global scope and objectives of the Call that need to be checked by candidates when formulating the proposal, for eligibility.

Scope

This **Call Module on Hydrogen and Renewable Fuels** is launched within the scope of CETPartnership TRI3⁵⁴. In the case of storage technologies there are various programmes covering R&D related to batteries, which justifies focussing on alternative solutions for storage, namely by using energy carriers. In coherence with CETP SRIA, utilisation of a wide range of energy vectors, in particular hydrogen, and advanced and renewable fuels, as well as hybrid solutions are expected to support cross-sectoral integration. Appropriate fuel and chemical technologies will serve flexibility and sector coupling needs in the energy system and are important enablers for integration with other sectors such as industry and transport. Hence, this Call aims to support projects on hydrogen⁵⁵ and renewable fuels technologies, from the production of the fuel to its end-use.

The production of **hydrogen** plays a key role in any industrial society, since hydrogen can be used to store energy and for many essential chemical processes, as fuel to power electric motors via fuel cells, or as an input to produce e-fuels⁵⁶, biofuels and other hydrogen carriers like ammonia, or to power gas turbines.

Further development of hydrogen technologies is necessary to reduce cost and improve process integration and business models. Europe's goal of a **hydrogen economy** can be met cost-effectively when considering the production of **green or blue hydrogen**, particularly during integrated natural gas reforming and CO₂ capture. Hydrogen enables the decarbonisation of the heating/cooling of the building stock, transport sector, power sector, and other industrial facilities. However, upscaling of Europe's hydrogen infrastructure, liquid hydrogen conditioning as well as large-scale, safe transport of liquid hydrogen energy carriers are major challenges, as well as its end-use in the different sectors.

⁵⁴ <https://cetpartnership.eu/tri/3>

⁵⁵ This includes hydrogen produced with maximum emission of 3 kg CO₂eq/kg H₂ (EU taxonomy).

⁵⁶ **Electrofuels** or **e-fuels** (synthetic fuels) are an emerging class of drop-in replacement fuels that are made by storing energy from renewable sources in the chemical bonds of liquid or gas fuels, aiming to be a carbon-neutral fuel. They are an alternative to aviation biofuel. The primary targets are butanol, biodiesel, and hydrogen, but include other alcohols and carbon-containing gases such as methane and butane.

Since hydrogen will be critical for the Clean Energy Transition and for reaching climate neutrality by 2050, it is crucial to coordinate the R&I initiatives between the CETP and the Clean Hydrogen partnership (e.g. what blue vs. green hydrogen covers and what the topics can be for collaboration). In the short and medium-term, hydrogen can be produced from fossil fuels with CCS, or from biomass or low-carbon power. Though water electrolysis has the advantage of producing extremely pure hydrogen (>99.9%), it is still possible to produce high purity hydrogen by natural gas reforming or gasification of biomass and other solid feedstocks (coal, waste plastics and municipal solid waste) through further hydrogen separation or purification.

Integration of hydrogen production and CCS offers significant opportunities for cost reduction. Commercial technologies for this type of hydrogen production are available but not implemented in large scale. **Biomass** can be used to produce different kinds of fuels. Production of hydrogen from biomass through anaerobic digestion, fermentation, gasification, or pyrolysis (all with bioenergy produced with CCS, i.e. BECCS) are at earlier stages of commercialisation. Hydrogen production with BECCS is attractive as it would deliver negative emissions, although it would compete with other sources of demand for biomass.

Considering the production of hydrogen to store energy in situations of surplus of intermittent power production, further research efforts and developments are also needed, as it is the case of electrolysis using non-purified water sources.

The international focus on **renewable fuels** is growing steadily to achieve a carbon neutral society. Renewable fuels are environmentally friendly energy carriers and important flexibility options are required to achieve a sustainable energy system. Important for a net-zero energy system is the cost-effective provision of thermo-, photo- and electrochemical solar fuels, as well as the supply of advanced biofuels from sustainable biomass. Renewable fuel production, particularly when coupled with power-to-X (e.g. biogas or biosyngas upgrading and solar fuels) and CCUS, offers major opportunities for greenhouse gas mitigation and negative emissions. The provision of such renewable fuels is crucial for industry, as well as for the residential and transport sectors. Low-cost production of such fuels to meet the needs of specific market segments (heavy-duty road transport, shipping, aviation, heat and power generation) requires a clear entry strategy.

The use of **renewable ammonia** (made from sun, air, and water) is expected to increase for both fertiliser and e-fuels. The advantage of renewable ammonia is that its production does not require a CO₂ source, it is easy to transport, and it is an established commodity. Thus, ammonia can be produced at remote locations with access to cheap renewable electricity. Ammonia is not yet approved or tested as a fuel for transport applications (e.g. in marine engines), but there are ongoing projects to test the feasibility, also considering hazardous aspects regarding handling of ammonia.

Electrofuels (e-fuels/synthetic fuels made by storing energy from renewable sources) are expected to impact aviation and shipping in all countries, most likely as sustainable jet-fuel for aviation and as either ammonia or methanol for marine. For short distance ferries, batteries or hydrogen will be an option. The technology for producing e-fuels requires further development before reaching technical and commercial maturity.

In order to enable the most rapid introduction of new fuels, selected end-user application technologies are also supported within this Call Module.

The hydrogen and renewable fuels Call Module strives to be complementary to calls for proposals issued by the EC under the HE Work Programme, in particular the calls from the [Clean Hydrogen](#)

Partnership⁵⁷, the Circular Bio-based Europe Joint Undertaking⁵⁸, the Clean Aviation Joint Undertaking⁵⁹, the Towards zero emission road transport (2Zero)⁶⁰ and the Zero-emission Waterborne Transport⁶¹, or other available instruments, including the national research programmes planned by the countries involved in this collaboration.

Projects must focus on the technology but are also required to address cross-cutting dimensions such as the environmental, social, and economic challenges required to accelerate the implementation of these renewable or low carbon, low-footprint fuels. However, projects dedicated to cross-cutting dimensions alone are not eligible for funding.

The Call Module seeks to finance innovative projects which can contribute, support, and provide results to future or already existing pilot and demonstration installations.

Projects focusing on developing new pilot and demonstration facilities are required to illustrate the potential for upscaling to industrial size either in a demo phase or early commercial phase.

Target topics

This Call Module will focus on the development and demonstration of innovative and cost-, energy- and carbon-/resource-efficient technologies for hydrogen and renewable fuels along the whole value chain.

Hydrogen technologies

Considering that the Clean Hydrogen Partnership Call for proposals covers well a large part of this R&D domain, and more specifically water electrolysis, hydrogen storage (in solid materials, high pressure and liquid form), transport and distribution and fuel cells development, the topics are limited to:

- New or improved processes for hydrogen production, as:
 - from water through new electrolysis concepts (alternative to AEMEC, Alkaline electrolysis, PEMEC and SOEC) or processes alternative to electrolysis, including high temperature or solar processes (solar hydrogen), or
 - e.g. blue hydrogen or hydrogen obtained from biomass or other resources (waste...), potentially coupled with CCS, including their integration with other processes like electrolysis
- Storage of hydrogen through ammonia or other hydrogen liquid carriers (like LOHC); for the production of ammonia, research into alternative, economically viable, less energy-intensive processes to the commercial Haber-Bosch process is encouraged
- Infrastructure and distribution aspects, including pipeline reuse and cost competitive materials for pipelines
- End-use applications are considered, as presented later in uses of hydrogen together with renewable fuels, with the main objective of substituting in part or fully the use of fossil fuels in different sectors

⁵⁷ https://www.clean-hydrogen.europa.eu/index_en

⁵⁸ <https://www.cbe.europa.eu/>

⁵⁹ <https://www.clean-aviation.eu/>

⁶⁰ <https://www.2zeroemission.eu/>

⁶¹ <https://www.waterborne.eu/partnership/partnership>

Renewable fuels

This topic is dedicated to new or improved processes and technologies for production of renewable fuels with low or zero carbon footprint, including biofuels and other synthetic fuels (such as e-fuels or solar fuels). Biomass and other feedstocks for the production of biofuels may be considered (taking into consideration the question of availability, cost, and competition with other uses). Different processes (thermo-, photo- and electrochemical, biological...) and their possible combination can be considered, namely on the following topics:

- New or improved conversion processes for renewable fuels production, using different types of feedstocks including wastes
- New or improved upgrading technologies, such as those applied to biogas and biosyngas for biomethane production
- New or improved cost-efficient methanation technologies
- New fuels for marine engines, aviation (SAF's) and heat and power generation
- Renewable ammonia, to include cost-effective production technologies using different types of feedstock (e.g. H₂, wastes, residual liquids as urine)

Uses of hydrogen and renewable fuels

This topic aims to support projects on end-use technologies using hydrogen or renewable fuels, targeting in particular the following priority uses: heavy-duty long-distance transport vehicles and machinery (road, off-road, rail, ship, and aviation), power production, stationary residential use and industrial use.

Aviation is undoubtedly a relevant field of application for sustainable fuels. There are numerous 2023 calls for proposals in HE (Cluster 5 Destination 5) respectively the Clean Hydrogen and the Clean Aviation Partnership programme; however, any intervention at this level will have a significant impact on climate. In the case of this Call, the focus is on renewable fuels addressing sustainable aviation fuels that can substitute jet fuel of fossil origin. This topic on uses of hydrogen and renewable fuels (including renewable ammonia) covers technologies for mobility, industry and residential use, such as:

- FCEV heavy duty, long-distance road transport vehicles
- FCEV locomotives
- FC off-road vehicles and mobile machinery (e.g. mining)
- Waterborne applications of hydrogen and renewable fuels
- New and innovative combustion concepts to substitute fossil fuels use in industry
- Combined heat and power systems with less than 30% output coming from electricity
- Stationary residential use
- Sustainable mobility (marine and aviation)

The projects should focus on system solutions at vehicle level based on component developments and includes fuel station technologies for hydrogen and renewable fuels. In terms of fuel transformation technologies, fuel cells or combustion engines can be considered, depending on the targeted application.

Cross-cutting issues related to the uses of hydrogen and renewable fuels, such as the suitability of the fuel (hydrogen, ammonia, methanol, methane...) and the technology using it to the specifications of the targeted uses, pollutant emissions (e.g. NO_x for combustion processes), safety of use, stability and ageing of the fuels, etc. will be considered.

Cross-cutting issues

Projects are required to consider cross-cutting issues, such as:

- Consumer attitudes, risk perception and the levers which could influence consumer behaviour
- Life cycle, techno-economic and environmental impact analyses, including water, land and energy consumptions aspects
- Barriers, opportunities, and solutions to scaling up
- System analysis and integration of processes in the energy system, continuity/intermittence
- Digitalisation as part of the project

Regarding the Technology Readiness Level, this Call Module aims at supporting projects to reach TRL 5 or above by the end of the project. Activities with lower TRL levels may be included if they contribute to the higher TRL goal of the project.

Expected impact

Projects funded under this Call Module are expected to have a significant bearing on accelerating the development and use of hydrogen and renewable fuel technologies and provide results showing significant CO₂ reduction by 2030.

Supported projects are expected to deliver results that have a significant impact on promoting the deployment of new and cost-efficient technologies with a significant contribution to the green transition.

Target RDI approaches/TRLs

This Call Module aims to support projects reaching TRL 5 or above. Activities with lower TRLs may be included if they contribute to the higher TRL goal of the project.

Project consortia

Consortia may consist of partners from universities, companies, industry organisations, local/regional governments, research organisations and NGOs.

Consortia may consist of partners **across several positions and disciplines** within research and development systems (i.e. fundamental targeted research, applied research, innovation, business etc.). The consortia must demonstrate the interest of industry partner(s) by actively involving them in the project as formal partners.

Project duration and budget

Proposals must have a project duration between one and three years.

As for project budget, see **Section 4.3**.

CM2023-06 Heating and cooling technologies

Objectives

The CETPartnership Transition Initiative Heating and cooling (TRI4⁶²) will contribute to Challenge 4, “Efficient zero emission Heating and Cooling Solutions”, formulated in the CETPartnership SRIA⁶³.

This initiative’s overarching goals are to provide enhanced and improved heating and cooling technologies and systems for all major parts or climate zones of Europe by 2030 and to enable 100% climate-neutral heating and cooling by 2050. The energy crisis caused by the war in Ukraine has clearly shown that Europe needs to repower and rethink its heating and cooling policy (ref. REPowerEU⁶⁴). Better, cheaper, easier applicable and climate-neutral heating and cooling technologies are needed to provide thermal comfort while phasing out fossil fuel-fired dependence.

The **objective** of successful projects, developing technologies, methods, knowledge or innovations should be the following:

- For pilots and demos (aiming towards TRL 7, 8 or 9 after project completion), the innovation must enable cost reduction and/or an increase in competitive market opportunities and/or environmental protection compared to state-of-the-art today. Innovations impacting societal acceptability, safety, and/or circularity are also within scope. Pilots and demos are realised in the operational environment, in ‘real life’.
- For applied research and development (aiming towards TRL 5 or 6 after project completion), the project’s output must enable significant cost reduction and/or a significant increase in competitive market opportunities and/or environmental protection and/or better tools and methodologies compared to state-of-the-art today. Innovations significantly impacting societal acceptability, knowledge development, experience sharing, safety, and/or circularity are also within scope. Such projects have a valid proof-of-concept before starting and typically develop the innovation in detail in a laboratory or similar environment.

This Call Module (**CM2023-06**) complements various Call Modules in the CETPartnership Joint Call:

- PV/T is covered in **CM2023-03** (TRI2).
- Concentrated solar power is covered in **CM2023-03** (TRI2), while concentrated solar for thermal applications in the industry is covered by this Call Module (**CM2023-06**).
- Geothermal energy technologies are covered in **CM2023-07**.
- Thermal storage *technologies* to be integrated into the built environment or industrial applications are covered in this Call Module, whereas thermal storage technologies with a focus on subsurface utilisation are referred to in **CM2023-07**.
- Projects focusing on integrating heating and cooling in regional or industrial energy systems or the built environment are referred to **CM2023-08**, **-09**, and **-10A/10B**, respectively.
- In case of doubt where to best propose your project, consult with your funding organisation.

⁶² <https://cetpartnership.eu/tri/4>

⁶³ https://cetpartnership.eu/sites/default/files/documentation/CETP%20SRIA_v1.0_endorsed_compressed_0.pdf

⁶⁴ https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131

Scope

This Call Module targets innovation in all relevant areas for developing a secure, sustainable, competitive and affordable climate-neutral heating and cooling supply (Figure 8.2). Projects should address one or more of the following areas:

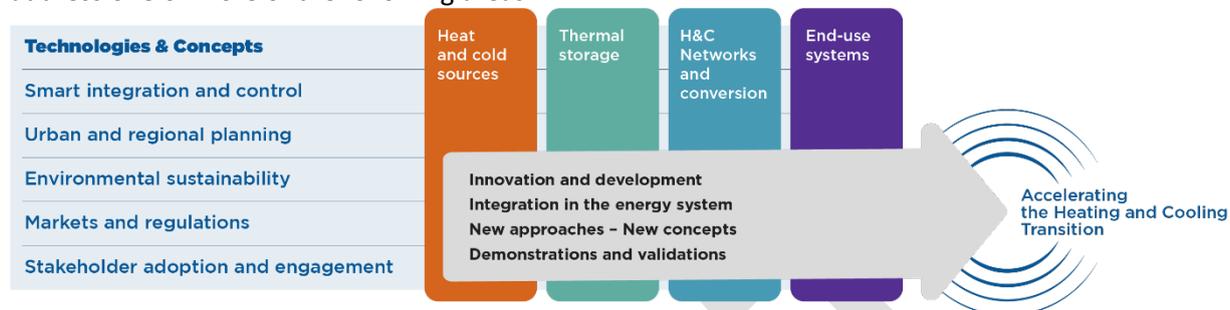


FIGURE 8.2. SCOPE MODULE 6 HEATING AND COOLING TECHNOLOGIES.

- **Heat and cold sources**, Innovative approaches for solar thermal, local and regional excess resources, renewable cooling technologies, concentrated solar for (industrial) thermal energy purposes, ambient heat and cold from the air, surface water, sewers etc., biomass and organic waste and excess heat from industry.
- **Thermal storage**, new storage technologies and storage-related innovations aiming at, e.g. small-scale hour-to-day thermal storage in industry and the built environment, smart systems balancing supply and demand, excess power to thermal energy, seasonal thermal storage integrated into a building or DHC (District heating and cooling) system.
- **Heating and cooling networks, conversion**, and integration, including but not limited to innovations for more cost-efficient heating and/or cooling networks and their operation, retrofit of heating and/or cooling networks, conversion technologies such as heat pumping technologies, in the built environment and industry.
- **End-use systems**: innovative distribution systems within the end-user system (typically a building or a home) are relevant to the heating and/or cooling system because the temperature level matters.

Across these themes, the horizontal bars indicate essential ‘areas of interest to adopt innovations in society’– including applications in buildings and meeting the industry’s demand. The vertical bars indicate the technological scope. The arrow in the figure symbolises the forward and future-oriented approach that builds on these various aspects.

The projects resulting from this Call are expected to encompass projects both relating to the built environment or industrial end-users. For the built environment, the projects may focus on district heating and/or cooling systems and other collective systems, but also on individual solutions.

Proposals are expected to explain their contribution to the objectives of the Call Module and quantify this contribution to the extent that this is possible. Successful projects in the Call Module should contribute to one or more relevant **cross-cutting**, non-technological themes whenever appropriate. A close interconnection between sources and their temperature level, conversion and distribution technologies, flexibility for the energy system and end-user requirements should be sought for heating and thermal storage operations. Projects should demonstrate their market relevance and potential impact.

Project Consortium Partners must ensure that their proposed work agrees with the funding

instrument of their relevant funding organisation – consult Annex B to this Call Module.

Expected impact

Projects funded by this Call should improve business cases and/or increase the competitive market opportunities and environmental protection, compared to state-of-the-art today, through research and innovation. The projects' results must emphasise market-driven innovation activities, aimed to be ready for large-scale implementation by 2030. However, projects may include lower TRLs depending on national funding rules.

Project outcomes are expected to help accelerate the time to market of secure, sustainable, competitive, affordable and climate-neutral heating and/or cooling solutions. Projects can also focus on bringing upcoming technologies to a level of validation in a relevant environment or integrating their activities into already viable and ongoing demonstration or piloting projects.

This Call Module envisages technical projects that develop innovations or new solutions that may address **cross-cutting topics** such as economic modelling, social aspects, environmental concerns, etc. The projects are encouraged to consider **cross-cutting topics** in their work explicitly. However, Project Consortium Partners must ensure that their proposed work meets national funding instruments. Proposals that exclusively consider research on sustainability or social acceptance cannot be funded.

Target RDI approaches/TRLs

Projects are expected to demonstrate real progress and target to bring the TRL of their innovation to TRL 5, 6, 7, 8 or 9 after project completion.

Projects need to assess the TRL (i) before their work and (ii) indicate by how many levels the technology readiness advances in case of a successful outcome of their project. Projects need to aim at advancing towards TRLs 5, 6, 7, 8 or 9. There will be an emphasis on market-driven projects aimed to be ready for large-scale implementation by 2030, implying industrial relevance for all projects. However, activities at lower TRLs may be included if they contribute to the higher TRL goal of the overall project.

Project consortia

This Call Module encourages innovative entrepreneurs in small, middle-sized, and large companies, and researchers at research organisations, and academia to propose. In many partner countries, local and regional governments are also eligible for funding and could be part of consortia.

Active involvement of the private sector and/or organisations that will own new demonstrators/installations developed as part of the project is highly recommended. Likewise, project leadership from such organisations is encouraged, in particular to maximise the impact of technological development in the private sector.

The Call Module encourages consortia with a broad geographic spectrum. Each project consortium must demonstrate the alignment with the respective funding bodies' national interest (see national/regional Annexes) and demonstrate the Project Consortium Partners' competence to implement the project.

Project duration and budget

Proposals must have a project duration between one and three years.

As for project budget, see **Section 4.3**.

DRAFT

CM2023-07 Geothermal energy technologies

Objectives

The CETPartnership [TRI4](#)⁶⁵ Heating and cooling and [TRI2](#)⁶⁶ Power technologies aim to contribute to their respective Challenges in the CETPartnership [SRIA](#)⁶⁷, by launching this Call Module for geothermal energy in the Call.

The Call Module will address a broad range of geothermal energy-related innovation, development and research projects, for heating and cooling, power generation, underground thermal energy storage (UTES), and the co-production of geothermal minerals.

The **objective** of successful projects, developing technologies, methods, knowledge or innovations, should be the following:

- For pilots and demos (aiming towards TRL 7, 8 or 9 after project completion), the innovation must enable cost reduction and/or an increase in competitive market opportunities and/or environmental protection compared to state-of-the-art today. Innovations significantly impacting societal acceptability, safety, and/or circularity are also within scope. Pilots and demos are realised in the operational environment, in 'real life'.
- For applied research and development (aiming towards TRL 5 or 6 after project completion), the project's output must enable significant cost reduction and/or a significant increase in competitive market opportunities and/or environmental protection and/or better tools and methodologies compared to state-of-the-art today. Project output significantly impacting societal acceptability, knowledge development, experience sharing, safety, and/or circularity are also within scope. Such projects have a valid proof-of-concept before starting and typically develop the innovation in detail in a laboratory or similar environment.

This Call Module complements various Call Modules in the CETPartnership joint Call. In case of doubt where to best propose your project, consult with your funding organisation.

- Thermal storage with a focus on geological storage is covered in this Call Module (**CM2023-07**), while **CM2023-06** focuses more broadly on thermal storage technologies.
- Projects focusing on the *integration* of geothermal energy and thermal storage in regional or industrial energy systems or the built environment are referred to as **CM2023-08**, **-09**, and **-10A/10B**, respectively.

Scope

1This Call Module targets innovation, research and development in how geothermal energy is supplied and integrated into Europe's future energy system. The scope includes:

- Geothermal energy for heating and cooling
- Geothermal energy for power generation
- Underground thermal energy storage (UTES)
- Geothermal energy with the co-production of minerals

⁶⁵ <https://cetpartnership.eu/tri/4>

⁶⁶ <https://cetpartnership.eu/tri/2>

⁶⁷ https://cetpartnership.eu/sites/default/files/documentation/CETP%20SRIA_v1.0_endorsed_compressed_0.pdf

Successful projects may address one or more of the three themes shown in Figure 8.3, which cover all stages in the development cycle of a secure, sustainable, competitive, and affordable geothermal installation.

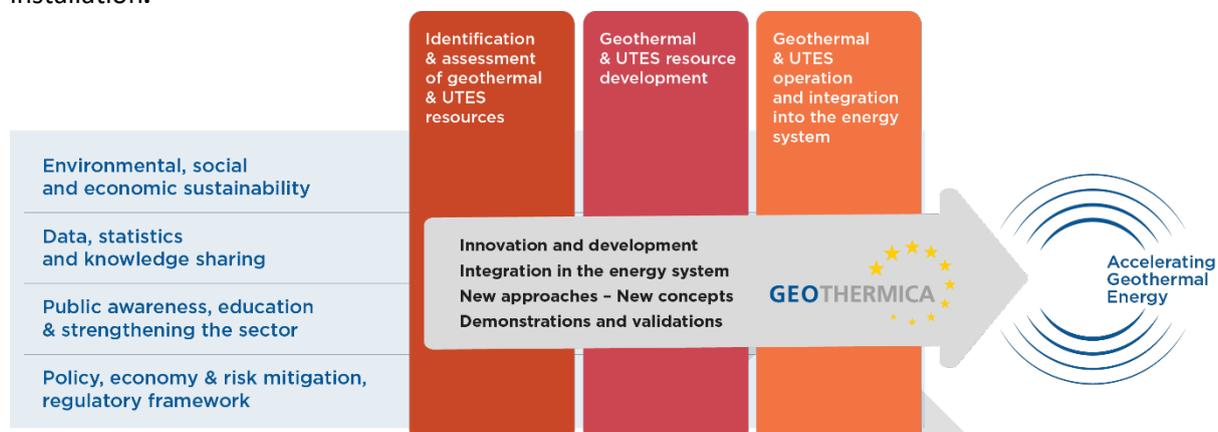


FIGURE 8.3. SCOPE CALL MODULE 7 GEOTHERMAL ENERGY TECHNOLOGIES

- **Identifying and assessing geothermal and underground thermal energy storage (UTES) resources, reserves and reservoirs:** Innovative and improved prospecting and exploration techniques and modelling methods to identify and assess geothermal resources at all depth levels.
- **Geothermal & underground thermal energy storage (UTES) resource development:** New drilling and well completion technologies, reservoir optimisation, stimulation and innovative systems to manage induced seismicity.
- **Geothermal operation and integration into the energy system:** Innovative concepts with geothermal energy as part of the energy system; geothermal reservoirs for heating, cooling and storage; innovative power cycles; novel revenue streams from additional side benefits from geothermal utilisation (such as mineral extraction); innovative applications in the built environment and industry. For operation, novel approaches to improve well injectivity & reliability and availability of injection operations; novel equipment, materials and methods for lowering and optimising operating expenses; disruptive smart reservoir management technologies; and innovative approaches to managing induced seismicity during production.

Across these themes, four **cross-cutting**, non-technological thematic aspects are relevant for 'Geothermal Energy Technologies'; sustainability and safety, knowledge sharing, enhancing public awareness and the sector's strength, and activities related to policies and regulations (Figure 8.3). Proposals are expected to explain their contribution to the objectives of this Call Module and quantify this contribution to the extent that this is possible. Successful projects in this Call Module should contribute to one or more relevant **cross-cutting**, non-technological themes. A close interconnection between sources and their temperature level, conversion and distribution technologies, flexibility for the energy system and end-user requirements should be sought for heating and thermal storage operations. Projects should demonstrate their market relevance and potential impact. The Call Module considers all geological depth levels.

Project Consortium Partners must ensure that their proposed work agrees with the funding instrument of their relevant funding organisation – consult the national Annexes to this Call Module.

Expected impact

Projects funded by this Call should improve business cases and/or increase the competitive market opportunities and/or improve tools and methodologies and/or environmental protection, social acceptability, strategic knowledge, safety and/or circularity for geothermal energy. The projects' results must emphasise market-driven innovation activities, aimed to be ready for large-scale implementation by 2030. However, projects may include lower TRLs depending on national funding rules.

Project outcomes are expected to help accelerate and implement geothermal energy solutions. Projects can also focus on bringing upcoming technologies to a level of validation in a relevant environment or integrating their activities into already viable and ongoing demonstration or piloting projects.

This Call Module envisages technical projects that develop innovations or new solutions that may address **cross-cutting topics** such as economic modelling, social aspects, environmental concerns, etc. The projects are encouraged to consider **cross-cutting topics** in their work explicitly. However, Project Consortium Partners must ensure that their proposed work meets national funding rules. Proposals that exclusively consider research on sustainability or social acceptance cannot be funded.

Target RDI approaches/TRLs

Projects are expected to demonstrate real progress and target to bring the TRL of their innovation to TRL 5, 6, 7, 8 or 9 after project completion.

Projects need to assess the TRL (i) before their work and (ii) indicate by how many levels the technology readiness advances in case of a successful outcome of their project. Projects need to aim at advancing towards TRLs 5, 6, 7, 8 or 9. There will be an emphasis on market-driven projects ready for large-scale implementation around 2030, implying industrial relevance for all projects. However, activities at lower TRLs may be included if they contribute to the higher TRL goal of the overall project.

Project consortia

This Call Module encourages innovative entrepreneurs in small, middle-sized, and large companies, and researchers at research organisations and academia to propose. In many partner countries, local and regional governments are also eligible for funding and could be part of consortia.

Active involvement of the private sector and/or organisations that will own new demonstrators/installations developed as part of the project is highly recommended. Likewise, project leadership from such organisations is encouraged, in particular to maximise the impact of technological development in the private sector.

This Call Module encourages consortia with a broad geographic spectrum. Each project consortium must demonstrate the alignment with the respective funding bodies' national interest (see national/regional Annexes) and demonstrate the Project Consortium Partners' competence to implement the project.

Project duration and budget

Proposals must have a project duration between one and three years.

As for project budget, see **Section 4.3**.

DRAFT

CM2023-08 Integrated regional energy systems

Objectives

The objective of this Call Module is to build Energy Transition Ecosystems all over Europe. The focus is on local and regional energy systems with the need owners⁶⁸ of specific regions⁶⁹ in the centre with projects that bring them together on a European level. The intention is to fund a portfolio of projects dealing with solutions for different regional characteristics. The characteristic can be described freely by the consortium, according to their perception what is of relevance in their specific geographical context for example an industrial or agricultural setting, wind or solar dominated system, and may or may not include specific infrastructure like heating grid, geographical terrain (plains or mountains), etc.

An Energy Transition Ecosystem can have specific characteristics such as:

- Located in a geographical context and has specific characteristics (urban, rural, agricultural, industrial, islands, etc.)
- Enabling a secure, resilient and CO₂-free regional energy supply for a specific regional context
- Use of flexibility of locally and regionally available energy sources, often with a focus on increasing security and resilience
- Meeting the individual local and regional requirements in terms of generation, demand, and goals
- Sustainable use and optimisation of local and regional infrastructures and local and global resources
- Use of synergies for user and consumer structures from different sectors (including, for example, municipalities, industrial plants or the transport system) and associated consumption patterns

The aim is to initiate projects driven by consortium of need owners in a regional / geographical context with the intent to develop model system solutions. These solutions should provide opportunities and synergies for active participation in the energy system and have a high potential for implementation. Scaling up in this context means that there is a high potential for replicability of the solution in similar environments across Europe.

The target for this Call Module is to demonstrate how local stakeholders, regulation and markets enable various technologies on different levels to work together in an integrated system. The development of regional and local energy systems should be orchestrated within framework, which reaches and impacts the maximum number of relevant stakeholders. Important local community and regional stakeholders include but are not limited to: municipalities, innovation clusters, ecosystems and programmes, small and medium-sized enterprises (SMEs), infrastructure providers and operators, etc. Interregional and transnational innovation ecosystems such as cluster networks, start-ups networks, etc. are also relevant.

68 "Need-owner" refers to the role of an entity (e.g. public agency, local/regional authority, energy grid manager/owner, company, building owner etc.), that seek a solution to a specified need (problem) within its area of operation. The "need-owner" has practical insights into what the actual need is and an interest to be involved in the development of a solution. This ensures the development of an optimal solution and facilitates the "need-owner(s)" acceptance and implementation of the solution. There can be more than one "need-owner" to the same need.

69 By "region" we mean the cluster represented by assets and actors of local economy and community that can contribute to the energy exchanges and flows.

This Call Module does not focus on the technological development of individual solutions, but on appropriate system solutions in the specific regional context. Characteristics of potential initiatives may include:

- Encourage consortia to further develop already existing regional initiatives by adding either new aspects/objectives or new partners
- Connect to ongoing or recently finished demonstration projects and thereby utilise pre-existing test infrastructure, knowledge, cooperation of key demos, transfer of results, opening-up, etc.
- Design the structure around integrated approaches, involving **cross-sectoral and interdisciplinary research and innovation**
- Refer to existing local/regional climate, energy and implementation plans or roadmaps

Therefore, projects should focus on regionally anchored ecosystems with the need owners of the region and bring them together at European level.

Expectations for the transnational collaboration:

Energy Transition Ecosystems can be found in a broad range of settings for example: large urban systems, the integration of municipalities or smart energy communities, and often include the integration of multiple sectors like industry, agricultural, public or tourism.

The transnational cooperation of these ecosystems will help foster a deeper understanding of the different infrastructural and socio-economic contexts. The transfer of knowledge and the transfer of solutions to other regions with similar conditions will attract larger market players, more efficient use of resources and accelerate co-transition of regional energy systems. The benefit of addressing **cross-cutting issues** in a transnational approach ensures that learnings can be shared and create robust transition pathways across Europe.

Scope

The scope of this Call Module is the creation of resilient and secure energy transition regions, which efficiently provide, host, and utilise high shares of renewables in the dynamic local or regional supply by 2030. A crucial corner stone for this Call Module is the mission driven focus where relevant local and regional stakeholders (need-owners) have a central role in the problem definitions and in the implementation of the project.

These integrated local and regional energy systems must be validated by transnational cooperation on the European level. Such systems shall provide replicable solution models that both meet the individual local and regional requirements and demand, as well as provide scalability and replicability on a national and transnational level.

Target topics

Challenges that the projects may address:

Regional aspects

- Develop integrated regional and local energy systems that enable a secure, resilient and fossil free regional energy supply, up to and beyond 100% in the dynamic local or regional supply

- Increase renewable energy supply (RES), electric vehicles (EV) and storage hosting capacity of distribution systems to reduce energy dependence
- Leverage synergies and utilise flexibilities in locally and regionally available energy sources (including aspects of heating, cooling, electricity and local fuels) and involve **cross-sectoral integration** of multiple (economic) sectors like transport, industry, trade, and so on
- Include regional infrastructures as well as user and consumer structures driven by local municipalities, communities, industry and stakeholders from different sectors

Contribution to a secure and resilient European energy system

- Participation in inter-regional exchange of energy (e.g. city, rural areas)
- Demonstrate the ability of providing management of flexibility by cross-energy vector coupling and by efficiently integrating different energy carriers
- Contribute to interoperability in developing harmonised business processes for solutions
- Coordinate and link research activities with e.g. living labs to facilitate the development and field-testing of prototypes
- Develop regional climate strategies and Key Performance Indicators (KPI's) for climate neutral energy systems can guide policy makers and actors when adopting market design on European level

Market aspects

- Enable citizens, need-owners, and other stakeholders to take part in the related value chains
- Develop appropriate market and business models
- Focus on large scale markets for solutions and technologies
- Define target groups for the solutions

Partnership aspects

- Make a clear and locally relevant problem definition at the core of a process of interaction and iteration
- Define the target groups to answer the problem definition and achieve the goals
- Build partnerships for achieving strong relationships within the right target groups

Policy aspects

- Insights on how to overcome challenges and barriers related to governance, decision-making and the legal framework
- Guide regulatory frameworks for adaption in order to accelerate the energy transition

Expected impact

Projects funded under this Call Module are expected to contribute both to specific local and regional energy- and climate objectives and, at the same time, have a larger energy system relevance. The

Projects, that are related to system integration, should use the Three-Layer Research Model ⁷⁰ as a framework for their expected impact.

Expected impact of the projects in the framework of the Three-Layer Research Model:

- **Transition (Stakeholder Adoption)**
 - Active engagement of diversified stakeholders in the local and regional energy context including spatial planning and business development
 - Educated citizens respecting the importance of regional energy infrastructure as a key enabler for the energy transition
 - Solutions to overcome energy poverty with a goal of presenting the feasibility and usefulness of local energy supply

- **Marketplace**
 - Practical business and market models to unleash flexibility potentials on regional level including sector coupling
 - Adopted models to assess critical needs of multiple stakeholders as a contribution that will harmonise European framework conditions
 - Guidance on how to create local and regional value with sustainable energies

- **Technology**
 - Replicable and scalable model solutions as well as tools and guidelines for replicable innovation processes, where innovation is on a system level
 - Demonstrated integration or coupling of different energy sectors
 - Modernise and improve infrastructure (especially smart grids) as a key factor
 - Evolve and adopted models for interoperability in harmonised business processes and data exchange

Target RDI approaches/TRLs

The Call Module aims to support projects reaching TRL 5–9. Activities with lower TRLs (3–5) may be included if they contribute to the higher project goal.

Furthermore, given that projects in this Call Module are required to structure around integrated approaches, involving **cross-sectoral and interdisciplinary research and innovation**, the Readiness Level should be considered along more holistic approaches. In the absence of an equally established and commonly used readiness concept, this can be described, for example, by the Societal Readiness Level (SRL) defined according to Innovation Fund Denmark⁷¹.

The expectation is that projects in this Call Module will target solutions with a SRL in the interval SRL 5–8. If other Readiness Indicators such as System Readiness Level, Market Readiness Levels or alike are already in use nationally or seem more appropriate they can also be used.

Please refer to national funding agency requirement for more specific TRL and SRL requirements.

⁷⁰ The Three-layer Research Model is a framework that facilitates a structured approach to fostering innovation in project design. The model has a proven track record in Smart Grid development throughout Europe where it has contributed to compatibility, intermobility, scalability, and replicability. The different layers are transition, marketplace and technology. See also **Section 1.2**.

⁷¹ https://innovationsfonden.dk/sites/default/files/2019-03/societal_readiness_levels_-_srl.pdf

Project consortia

This Call Module aims to create a culture, which is conducive to innovation, allowing both companies and regional ecosystems to evolve over time. It is desirable to have projects driven by local and regional stakeholders (as defined above) working in close liaison with relevant research organisations and solution providers from the public and private sectors.

Target groups include the following entities:

- Local and regional authorities, stakeholder groups, aggregators
- Private and public need-owners, institutions and citizens, especially involving diversified stakeholders intent on implementing innovative and **cross-sectoral integrated solutions**
- Solution providers: technology product and system developers, service providers, etc.
- R&D institutes, local and regional innovation clusters, programmes and ecosystems, technology transfer agencies, triple helix organisations, and so forth

Projects should reflect the needs of a region of interest and cover as many local target groups as possible. Furthermore, the consortium should be able to implement the outlined exploitation plan successfully and independently after the end of the project.

For proposals that intend to work with former ERA-Net Projects, Demonstration, Real-Lab or Living-Lab approach, it is recommended to consider the JPP SES Living Labs and Testbeds Network⁷² when looking for partners. For Matchmaking opportunities please register at the CETPartnership platform⁷³.

For proposals that intend to work with data service solutions, it is recommended to consider the JPP SES network of Digital Platform Providers⁷⁴ when looking for partners.

Project duration and budget

See **Section 4.3**.

⁷² https://www.eranet-smartenergysystems.eu/Partners/Living_Labs

⁷³ <https://clean-energy-transition-partnership-2023.cetp.b2match.io/home>

⁷⁴ https://www.eranet-smartenergysystems.eu/Partners/Digital_Platform_Providers

CM2023-09 Integrated industrial energy systems

Objectives

The Call Module for Integrated Industrial Energy Systems (TRI6⁷⁵) **aims at developing and demonstrating a set of technical solutions for integrated industrial energy systems that enables efficient carbon-neutral industrial production sites and takes industrial energy systems into development as part of the entire energy system.** TRI6 focuses specifically on **integrated solutions across industries, across energy sectors and across public and private sectors** according to the CETPartnership SRIA⁷⁶.

Special emphasis in the Call Module is placed on solutions for system- and process-level integrations for efficient industrial power, heating, and cooling. The main industries that are considered include iron & steel, cement, pulp & paper, chemical, and food and beverage industries.

The Call Module will contribute to an innovation-based growth of the European economy and the European energy transition by supporting projects that accelerate the development of clean technologies by capitalising on synergies between programmes, both nationally and internationally, as well as by addressing **key cross-cutting issues**, lead to faster market uptake, upscaling, and increased EU's technological independence and global competitiveness⁷⁷. Projects are expected to increase their TRL up to 7 throughout the project duration so that they move closer to commercial readiness.

The Call Module will address topics such as sustainability, circularity, environmental impact, integration with local and regional energy systems, energy storage, CCUS and digitalisation and Artificial Intelligence. There are synergies with TRI3 and TRI5.

Scope

In the future, electricity will play a significant role as a “primary” energy source for the industries and new innovations are needed to accomplish the transformation of industrial electrification. Further, a large share of the industrial energy supply shall be based on renewable sources. Where carbon emissions cannot be avoided, CO₂ shall be captured, utilised for production of preferably long-lifetime products, or permanently stored. To produce negative emissions, capture, utilisation in long-lifetime products and storage of biogenic CO₂ from the exhaust gases, i.e. bio-CCUS, is an option.

While the energy transition of industries advances, industrial energy systems shall integrate with local, regional, and national heat and power networks and systems. Moreover, the energy and industrial systems shall together integrate as renewable power will also be used to produce hydrogen which can be utilised as energy carrier or raw materials in industrial processes or with CO₂ utilisation (CCU) to synthesise e-products for the replacement of fossil-based fuels and chemicals.

The integration of industrial energy systems with local, regional, or trans-regional energy systems supports national and European goals for carbon neutrality. As research, development, and innovation activities (RDI) for industrial carbon-neutrality are already funded at a national level in many countries,

⁷⁵ <https://cetpartnership.eu/tri/6>

⁷⁶ https://cetpartnership.eu/sites/default/files/documentation/CETP%20SRIA_v1.0_endorsed_compressed_0.pdf

⁷⁷ https://setis.ec.europa.eu/set-plan-progress-report-2022_en

a broader experience and knowledge sharing at an international level will be an advantage. Transnational co-operation will boost efficient technology transfer and leverage complementarities for building competitive European value chains.

Target topics

This Call Module is in line with the REPowerEU Plan⁷⁸ and focuses on the need for reducing energy consumption, substituting fossil fuels, and accelerating Europe's clean energy transition to bring down emissions and dependencies⁷⁹. Therefore, this Call Module welcomes proposals for research, development and innovation projects that contribute to one or more of the following challenges:

Challenge 1 – Reducing emissions from the industrial energy system

Funding in this area is directed to projects that contribute to reducing the industry's process-related greenhouse gas emissions and other emissions such as certain combustion emissions and diffuse emissions linked to process-related emissions. The objective is to finance technological leaps and to support industry's ambitions to change to more sustainable production.

Process-related emissions refer to emissions directly from industrial processes according to environmental reporting as well as to emissions that occur during the combustion of residual products from fossil raw materials in production processes, such as flaring of industrial residual gases. Emissions with an indirect connection to industrial processes are, for example, combustion emissions from on-site power and heat production.

Projects that focus on reduction of indirect emissions from industry can only be supported in cases where a reduction in direct emissions from processes is also included in the project or when they involve a technological leap for the industry. Therefore, projects that only involve conventional fuel changes will not be funded.

Challenge 2 – Integrating energy and resource efficient industrial energy systems

Funding in this area is directed to projects that increase knowledge and develop new and innovative processes and system integrations that improve sector coupling in an energy and resource efficient way between industrial energy systems and the energy system in general. **System-level integrations across sectoral boundaries** will provide support for a more flexible and robust European energy system based on a high degree of intermittent energy sources.

The projects in this area can include the role of industry in a larger perspective, i.e. integration between different industries or integration between an industrial site and the surrounding local or regional energy system, to create an energy- and resource-efficient system from a holistic perspective. The area thus comprises industrial and **cross-sectoral symbiosis**, including new industrial and system-integrated structures, i.e. projects that study physical exchanges of energy, material or residual streams in the form of, for example, excess heat or cool, operational and municipal wastes, residual materials and residual flows. This area can thus help to create circular economy solutions for the industry and local

⁷⁸ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2022:230:FIN>

⁷⁹ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/repower-eu-affordable-secure-and-sustainable-energy-europe_en

communities and regions.

Challenge 3 – Removing carbon emissions from the carbon cycle in industrial energy systems

Funding in this area is directed to projects that can contribute to removing industrial greenhouse gas emissions from the carbon cycle through emission separation combined with long-lifetime utilisation or long-term storage of carbon. Funding is also directed to projects that address the possibility for industries to implement CCU to produce energy products/synthetic fuels from their CO₂ emissions. Such chemical energy carriers could serve as energy storages and support balancing of the renewable-based future energy system. CCU production pathways might involve bioprocesses, e.g. with algae, or synthesis processes with clean hydrogen. Implementation of CCU, hence, might open new business opportunities beyond today's industrial production.

Special emphasis is put on greenhouse gas emissions of biogenic origin and on CO₂ taken out of the atmosphere so that effective long-term removal of carbon emissions from the carbon cycle can be achieved.

Expected impact

The expected impact from projects that are funded in the Call are that they contribute to making European industry a part of a climate-neutral economy. Funded projects will strive to:

- increase European industry's competitiveness
- support the development and pre-commercialisation of future disruptive technologies
- support a wider use of renewables and alternative energy sources as well as emission control technologies for reducing industrial emissions
- integrate renewable energy into the industrial energy system to aid increased industrial electrification
- increase resource -and energy efficiency of industrial energy systems through novel process and system integrations
- increase circularity through, for example CCU or the reuse of waste heat
- Increase the use of Bio-CCUS in industrial processes
- develop sustainable bioenergy and biofuels
- develop and integrate hydrogen-based technologies into the industrial energy system and infrastructures

Projects that are funded are expected to provide solutions to the challenges in the Call Module through new knowledge, skills, and technologies. The funded projects will also be expected to use need-owners, industrial advisory boards and/or a challenge driven approach to improve fit with industrial needs, to foster industrial acceptance and to boost exploitation of research results. Projects shall participate in CETP's working groups and workshops to share information, knowledge, ideas, and results to strengthen national and regional research, development and innovation policies.

Target RDI approaches/TRLs

This Call Module aims to support projects with TRL 3–7. Projects are encouraged to advance solution development towards TRL 7 by the end of the project so that the consortium members are ready to apply for follow-up funding for piloting or demonstration projects from other funding programmes like

EU's Innovation Fund⁸⁰. This to drive clean energy solutions faster towards commercial readiness and contribute to a more competitive European industry and a sustainable and de-carbonised European energy system based on renewable energy sources.

Project consortia

A project consortium is expected to include the following types of actors:

- Companies such as industrial companies, suppliers of technology and services
- Research institutes
- Universities and colleges' social science, humanities, technology, economic and science disciplines
- Municipal companies and other public sector organisations

Projects must involve industrial need-owners in the projects to provide for faster market diffusion, upscaling, and replication of solutions. If universities or research institutes are project leaders, they must have at least one need-owner attached to the project. If the project leaders are companies, their customers can be seen as need-owners so there is no need to attach a specific organisation to the project.

Project duration and budget

See **Section 4.3**.

⁸⁰ <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/innovfund>

CM2023-10A/10B Clean energy integration in the built environment

Objectives

The Call Modules **CM2023-10A/10B Clean energy integration in the built environment** cover both ROA (Research-Oriented Approach) and IOA (Innovation-Oriented Approach) projects.

The Call Modules' content is defined according to the CETPartnership SRIA⁸¹, elaborated according to the CETPartnership principles, seeking coordination with the SET Plan IWG5 (Implementation Working Group on Energy Efficiency in Buildings), IWG3 (Implementation Working Group on Positive Energy Districts(PED) as well as different ETIPs and covers the objectives of CETPartnership TRI7: Integration in the built environment⁸².

The CETPartnership SRIA proposes a wide picture of improvements in the field. The scope is organised around **new developments in integration and conversion of renewable energy in the built environment and digitalisation in the whole building life cycle**. In these Call Modules, particular emphasis is put on the interface with and the integration in the built infrastructure.

The Call Modules are intended to establish a portfolio of new solutions covering a fundamental part of the CETPartnership SRIA regarding RDI for integration in the built environment.

The Call Modules aim to enable transnational projects, which develop and provide new solutions for the built environment from a pure energy consumer towards becoming a prosumer (producer-consumers) of renewable energy and from a passive to an active role in the future energy landscape.

This should be achieved by focusing on the physical, technical and (where applicable) aesthetical integration of clean energy conversion technologies for power, heat and cold into buildings and more generally into the built infrastructure which thereby become integrated and active parts in energy networks (power, heat and cold).

The integration of electricity and heat storage as well as the integration of mobility concepts is also in the focus of these Call Modules.

RDI proposals should include the integration aspects in order to identify the expected role played in the built environment, reflecting the New European Bauhaus (NEB) integrated approach. The proposals should demonstrate their contribution to technology improvements through new solutions and capabilities, proof of concepts or optimisations including formalised test and validations.

Projects can apply either as ROA (**CM2023-10A**) or IOA (**CM2023-10B**) based on the target TRLs.

Scope

The scope of these Call Modules is to transform the built environment from a passive towards an active role in the future energy landscape. Two challenges are defined, namely:

⁸¹ https://cetpartnership.eu/sites/default/files/documentation/CETP%20SRIA_v1.0_endorsed_compressed_0.pdf

⁸² <https://cetpartnership.eu/tri/7>

- Challenge 1: Integrate renewable energy conversion technologies for power, heat and cold in buildings. Connect the buildings in networks. Integrate energy storage, zero emission fuel, and activate building parts as energy storage. (Measures contribution to CO₂ reduction and increased building renovation rates).
- Challenge 2: Digitalisation for planning, construction phase, commissioning, and operation as well as decommissioning and disposal. Methods of building performance assessment. (Measure carbon-neutral building stock, life cycle analysis (LCA)).

Proposals should identify the foreseen application(s) of the developments in different building contexts:

- Existing and new buildings
- Residential (urban, rural, isolated) and non-residential buildings (large public and private buildings, commercial malls, service and mobility infrastructures, logistics platforms such as ports, airports, railway terminals, roads, large parking areas)
- Old, historical and special buildings (cultural and built heritage)
- Different climate and geographical areas

Proposed projects should include a perspective for technology transfer including plans for verification and validation, data management and exploitation.

Proposals shall cover solutions for one or several points in the two proposed challenges. The challenges are non-exclusive. Solutions addressing parts of one challenge or parts of both challenges are welcome.

Challenge 1. Integrate renewable energy conversion technologies for power, heat and cold in buildings. Connect the buildings in networks. Integrate energy storage, zero emission fuel, and activate building parts as energy storage. (Measures contribution to CO₂ reduction and increased building renovation rates).

Climate-neutral buildings or building environment blocks that generate integrated electric and thermal energy, with increased use of local renewables, as well as generate local support (citizens and professional stakeholders) to reach sustainability in the long term.

Seamless integration of renewable energy technologies in the urban environment, building integrated photovoltaics (PV), several types of storage solutions, combined heat and power (CHP) technologies on fossil-free gaseous fuels (hydrogen or synthetic gases, biogenic gas, thermochemical solar fuels, electrochemical solar fuels) for historic integration districts or hard-to-retrofit buildings in the energy systems.

Building-to-Building energy and active buildings concepts. Aggregation of energy services and energy traceability.

Active facades: solar thermal, building integrated PV (BIPV), hybrid PV, PV-thermal, switchable windows, switchable thermal insulation and their system integration.

PV integration in buildings (including semi-fabricates): module installation, structural, thermal and functional integration, aesthetics solutions, power management, safety, operations and management, maintenance, decommissioning, recycling and disposal.

Integration of solar thermal energy in buildings and nearly zero energy buildings (nZEB) / passive-house concepts, combination with other solutions in hybrid products and the use of enablers of sector coupling including improvements at component level.

Integration of electricity and heat storage; integration of mobility concepts.

Decentralised storage tanks in buildings and built infrastructure for thermal flexibility.

Technologies for non-residential air-conditioning and ventilation.

Large building (malls, terminals, parking areas, building services) energy production and storage systems integration for efficient energy production and uses.

Challenge 2. Digitalisation for planning, construction phase, commissioning and operation as well as decommissioning and disposal. Methods of building performance assessment. (Measure carbon-neutral building stock, life cycle analysis (LCA)).

Digitalisation of in-building energy management by considering internal energy production and storage as well energy traceability for building-to-building energy flows and active buildings by smart contracts (span across energy vectors, increase flexibility and reduce peak loads).

Development of solar cadastres to assess the generation potential of solar energy from the scale of single buildings to energy districts and metropolitan/regional areas. The cadastre might also be linked to a database of suitable technologies to be ranked according to the specifications of the installation site.

Digitalisation in district heating and cooling networks: large scale collection data located throughout the district heating and cooling (DHC) production, transport, distribution and user chain, machine learning for optimal control of the network and support the analytics intended to maximise use of RES and residual heat to reduce the operational costs.

Built infrastructure as part of a local/regional decentralised energy system with consumer, prosumer and energy communities.

Contribution to open platforms for sharing data and models (digital twins) in support of the energy transition for research-based knowledge. Standardisation of the solutions.

Building Information Modelling (BIM) from the cradle to the grave including life cycle analysis. Offer circular-oriented services at different levels of the Construction and Demolition Waste (CDW) supply/value chain. Against the background of rising ecological pressure and threatening scarcity of primary raw materials, demolition has a fundamental role to play in the circular economy (CE) and global decarbonisation of the Construction sector, as a source of valuable CDW-originated materials and components that can be effectively recycled or reused into new built structures.

Smart tools for Smart Homes + smart buildings with the aim that buildings become active elements in the power supply system (and maybe also in a heat network – if present).

All the proposals shall analyse the cross-cutting dimensions (cf. Section 4.6). Identify which are applicable and elaborate the inclusion of those in the proposal.

Cross-cutting dimensions

Integrated approach considering technical, societal, economical, architectural, aesthetical, urban planning and transport sector issues, implementing the European New Bauhaus (NEB) values.

Synergies with widespread of energy communities, neutral and positive energy districts and climate neutral cities policies.

Needs of users have to be taken account for: issues of acceptance, participatory approaches to support the complex transformation processes, new ways of living and working, demography, urban-suburban relationships and sustainable mobility etc. Furthermore, the impact on rent pricing, affordable construction prices, comfort or also user data privacy have to be considered.

Need of adaptation to meet urban planning regulations and specifically preserve cultural heritage landscape (e.g. building, complex of buildings).

Increase the smartness of various building systems (energy management and control in broad view, heating, ventilation, electrical, information, ...) and evaluate it through objective indexes (Smart Readiness Indicator (SRI), ..).

Indoor Environmental Quality (IEQ) — indoor air quality (temperature, humidity, CO₂, Radon ...), lighting, noise, ergonomics—and their effects on occupants or residents comfort must be taken into account. Strategies for addressing IEQ include those that protect human health, improve quality of life, and reduce stress and potential injuries.

Solutions have to consider different economies of scale and climate context.

Standardisation of solutions, components and modules taking into account EU regulations.
Knowledge diffusion (specifically for historical and special buildings where the EU market is crucial).
Safety and security (cyber security, privacy, data protection, data rights) by design intended to generate trust in society and must be included in the proposals.

Expected impact

At scientific and technological level, the portfolio of projects will provide validated solutions ready to be included in new research and innovation processes intended to improvements and/or base for new developments. Valuable infrastructures in this environment should be visible and accessible to the RDI community.

At industrial stakeholders' level, participation of need-owners from the energy, building and installer industry is expected. Their participation should provide requirements in the projects intended to reinforce local industry and drive developments to affordable solutions.

It is expected to yield improved access and higher use of research results, innovation and knowledge. Presented solutions should drive new technologies towards commercial readiness by reinforcing connection with multipliers (architects, civil engineers, craftsmen, engineering offices, manufacturers), public bodies (regulators, standardisation institutions), as well as potential users of the developed solutions (i.e. municipalities, public and private property owners), creating high-quality new knowledge and skills in the complete built environment.

Proof methods of building energy performance assessment will support transition to carbon-neutral housing stock.

The prospect of standardised solutions, components and modules will benefit from larger markets and contribute to the efficient use of the funding. The increase of utilisation and sharing of research infrastructures is foreseen to mobilise innovation community.

A wide EU and international market supported by the diffusion of knowledge is the base of efficient responses in the integration of zero emission energy in existing, historical and special buildings as well as in mobility infrastructure.

In addition to the dissemination and experience sharing within the CETPartnership Knowledge Community, the projects are invited to participate in the activities and events organised by other partnership programmes like Built4People.

Target RDI approaches/TRLs

Projects can apply either as ROA (**CM2023-10A**) or IOA (**CM2023-10B**) based on the target TRLs:

- ROA covers the TRL range 3–5
- IOA covers the TRL range 6–9

The projects shall include a perspective for technological transfer including:

- Verification and Validation Plan
- Data management plan
- Results management and exploitation plan

At the pre-proposal stage, a clear mention of the corresponding planning should appear in the three evaluation criteria: Excellence, supporting project goals; Impact, as part of the expected outcome and impact; and Implementation, identifying deliverables in the work plan.

At the full proposal stage, an outline of the plans and references to the content should be included. Specifically, the versions/deliverables over the project implementation shall be included in the Implementation section.

Project consortia

TRI7 intends to establish, mobilise and attract project consortia from the energy, building and construction research (public and private research organisations, higher education institutions etc.) and industry (private SMEs, private large companies, etc.) to work together on holistic solutions for the future built environment.

Project duration and budget

As for project duration, see **Section 4.3**.

The Call Modules aims to support projects with an expected requested grant (but not limited to) in the range of €0.5–5 million.

DRAFT

Annex A. Reporting and Knowledge Community work package

Since all projects funded by the Call are expected to actively participate in the CETPartnership Knowledge Community, proposals must include the following tasks in the mandatory Reporting and Knowledge Community Work Package of your Work Plan and necessary resources in the project budget.

Even though the necessary resources depend on the project consortium composition, length, size and focus, the total estimated resources in the Work Package are as follows per project:

- 35–55 days/year
- €7 000–10 000 for travel, accommodation and related costs
- Minimum total costs €35 000

Estimated resources (days/year/project) per task are mentioned in the task description below.

The final organisation and implementation of the undermentioned tasks in each project will be determined in an iterative process with the CETPartnership Knowledge Community Management (KCM) using the CETPartnership Digital Collaboration Platform.

Knowledge Community events will mostly take place online. In case of onsite events, CETPartnership encourages Project Consortium Partners to consider traveling by train if feasible and compensating for the emission in case of traveling by air.

Task 1. Reporting

Resource estimation: 10 days/year/project.

The following deliverables must be reported to the Call.

Subtask	Description
1.1	Annual reporting
1.2	Final reporting by 2028 depending on the project end date
1.3	Public abstract of the main results at the project's end

Task 2. Contribution to formative evaluation

Resource estimation: 10–20 days/year/project.

Feedback based on the annual reporting in Subtask 1.1 will be given and implemented as follows:

Subtask	Description
2.1	Giving feedback Project Consortium Partners are expected to give feedback to other projects in a similar field.
2.2	Feedback implementation

The following feedback will be given to your project once a year and must be considered for implementation during the rest of the project duration:

- Feedback from the CETPartnership monitoring team
- In person feedback from Coordinators of other funded project at peer-to-peer online meetings where project results are presented and discussed

Task 3. Contribution to other Knowledge Community activities

Resource estimation: 15–25 days/year/project.

Each project will belong to one thematic working group organised by TRI(s) relevant to the Call Module and up to five cross-cutting working groups.

Subtask	Description
3.1	Living documents For each working group, each project must contribute to continuous development of spotlights and policy briefs related to the working group's topics by clarifying conclusions, giving feedback and examples etc. from own and other project results.
3.2	Meetings (working group) For each working group, at least one representative from each project must contribute to about one onsite meeting per project duration and two online meetings per year. This includes preparation for, participation in and follow-up of the meetings.
3.3	Communication and dissemination Each project must contribute to the following activities to detect synergies between funded projects and to develop joint communication and dissemination. <ul style="list-style-type: none"> ● Online meetings and workshops ● CETPartnership annual project events (hybrid)

Annex B. National/regional requirements

DRAFT

Annex C. Funding Organisations' participation per Call Module (this information is tentative)

Country/ region	Organisation	Acronym	Funding (€)	CM2023-01		CM2023-02	CM2023-03A	CM2023-03B	CM2023-04	CM2023-05	CM2023-06	CM2023-07	CM2023-08	CM2023-09	CM2023-10A	CM2023-10B
				Direct current (DC) technologies for power networks	renewables production, storage and system integration	Energy system flexibility: production, storage and system integration	Advanced renewable energy technologies for power production (ROA)	Advanced renewable energy technologies for power production (IOA)	Carbon capture, utilisation, and storage (CCUS)	Hydrogen and renewable fuels	Heating and cooling technologies	Geothermal energy technologies	Integrated regional energy systems	Integrated industrial energy systems	Clean energy integration in the built environment (ROA)	Clean energy integration in the built environment (IOA)
Austria	Austrian Research Promotion Agency	FFG	4 700 000	400 000 €						1 500 000 €			800 000 €	2 000 000 €		
Belgium-Flanders	Fonds Innoveren en Ondernemen	FIO	1 000 000		x	x	x	x	x		x	x		x	x	x
Belgium-Wallonia	Service public de Wallonie	SPW	1 500 000		x	x	x	x	x		x	x		x	x	x
Canada-Alberta	Emissions Reduction Alberta tbc	ERA	2 000 000 (tbc)					x	x							
Cyprus	Research and Innovation Foundation	RIF	1 500 000 (tbc)		x	x	x	x	x		x	x		x	x	x
Czech Republic	Technology Agency of the Czech Republic	TA CR	760 000		x	x			x					x	x	
Denmark	Energy Technology Development and Demonstration Programme	EU DP	1 340 000		x	x	x	x	x		x	x		x	x	x
Denmark	Innovation Fund Denmark	IFD	1 500 000		x	x	x	x	x		x	x		x	x	x
Estonia	Estonian Research Council	ETAG	150 000		x	x	x	x	x		x	x		x	x	x
Estonia	Ministry of Economic Affairs and Communications	MKM	150 000		x	x	x	x	x		x	x		x	x	x
Finland	Innovaatorahoituskeskus Business Finland	BF	5 000 000		x	x	x	x	x		x	x		x	x	x
France	Agence de la transition écologique	ADEME	1 000 000		x	x			x							
France	Agence Nationale de la Recherche	ANR	3 000 000		x		x		x		x	x				x
France-Pays de la Loire	Pays de la Loire Region Council	RPL	1 500 000					x								
Germany	Projekträger Jülich/Forschungszentrum Jülich GmbH (on behalf of BMWK)	PTJ (BMWK)	18 000 000		x	x	x	x	x		x	x		x	x	x
Germany-NRW	Projekträger Jülich/Forschungszentrum Jülich GmbH (on behalf of MWIKE)	PTJ (MWIKE)	1 000 000		x	x	x	x	x						x	
Germany-Saxony	Saxon State Ministry for Science, Culture and Tourism	SMWK	3 000 000		x	x	x	x	x		x	x		x	x	x
Greece	General Secretariat for Research and Innovation	GSRI	500 000		x	x			x		x					
Hungary	National Research, Development and Innovation Office	NKFIH	1 160 000		x	x	x	x	x		x	x		x	x	x
Iceland	The Icelandic Centre for Research	RANNIS	1 000 000						x		x	x				
Ireland	Geological Survey Ireland	GSI	200 000									x				
Ireland	Sustainable Energy Authority of Ireland	SEAI	500 000		x	x	x	x	x		x	x		x	x	x
Israel	Ministry of National Infrastructure, Energy and Water Resources	MoE	2 400 000		x	x	x	x	x		x	x		x	x	x
Italy	Ministry of Economic Development	MIMIT	16 000 000		x	x	x	x	x		x	x		x	x	x
Italy	Ministero dell'Università e della Ricerca	MUR	2 000 000				x				x					x

Country/ region	Organisation	Acronym	Funding (€)	CM2023-01 Direct current (DC) technologies for power networks	CM2023-02 Energy system flexibility: renewables production, storage and system integration	CM2023-03A Advanced renewable energy technologies for power production (ROA)	CM2023-03B Advanced renewable energy technologies for power production (IOA)	CM2023-04 Carbon capture, utilisation, and storage (CCUS)	CM2023-05 Hydrogen and renewable fuels	CM2023-06 Heating and cooling technologies	CM2023-07 Geothermal energy technologies	CM2023-08 Integrated regional energy systems	CM2023-09 Integrated industrial energy systems	CM2023-10A Clean energy integration in the built environment (ROA)	CM2023-10E Clean energy integration i the built environmen (IOA)
Latvia	Latvian Council of Science Ministry of Energy of the Republic of Lithuania	LZP ENMIN	tbc 1 400 000 (tbc)		x				x						
Malta	Malta Council for Science and Technology	MCST	500 000	x	x	x	x	x	x	x	x	x	x	x	x
The Netherlands	Dutch Research Council	NWO	tbc												
The Netherlands	Netherlands Enterprise Agency	RVO	8 000 000	x	x		x	x	x	x	x	x	x		x
Norway	The Research Council of Norway	RCN	4 610 000	x				2 560 000 €		x					
Poland	National Centre for Research and Development	NCBR	3 000 000	x	x	x	x			x		x	x	x	x
Portugal	Fundação para a Ciência e a Tecnologia Executive Agency for Higher Education, Research, Development and Innovation Funding	FCT UEFISCDI	500 000 (tbc) 1 500 000			x		x	x	x	x	x			
Romania	Agencia Estatal de Investigación	AEI	1 700 000	x	x	x	x	x	x	x	x	x	x	x	x
Spain	Centre for the Development of Technology and Innovation	CDTI	1 500 000	x	x	x	x	x	x	x	x	x	x	x	x
Spain-Asturias	Fundación para el fomento en Asturias de la Investigación Científica Aplicada y la Tecnología	FICYT	300 000	x	x	x	x	x	x	x	x	x	x	x	x
Spain-Basque	Departamento de Desarrollo Económico, Sostenibilidad y Medio Ambiente. Eusko Jauriaritza-Gobierno Vasco	EUSKADI	1 000 000	x	x	x	x	x	x	x	x	x	x	x	x
Spain-Basque	Ente Vasco de la Energía	EVE	1 000 000			x	x								
Spain-Cantabria	Regional Development Agency of Cantabria	SODERCAN	tbc												
Sweden	Swedish Energy Agency	SWEA	7 000 000	x	x	x	x	x	x	x	x	x	x	x	x
Switzerland	Swiss Federal Office of Energy	SFOE	10 300 000		x		x	x	x	x	x	x	x		
Switzerland	Swiss National Science Foundation	SNSF	550 000					x				x	x	x	
Tunisia	Ministry of Higher Education and scientific Research The Scientific and Technological Research Council of Türkiye	MHESR TUBITAK	400 000 1 000 000	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x	x x
Türkiye	Scottish Enterprise	SE	5 700 000	x	x	x	x	x	x	x	x	x	x	x	x
UK-Scotland	Department of Energy	DoE	6 000 000					5 000 000 €	1 000 000 €						
USA	TOTAL		121 420 000												

This document was created as part of the Clean Energy Transition Partnership, funded from the European Union's Horizon Europe research and innovation programme under grant agreement no. GA 101069750.