

D14.3

Project synergies report

WHITE RESEARCH

05/2026



Project Information

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COORDINATOR	CIRCE – Technology Center
PROJECT OVERVIEW	The JOULIA project is focused on transforming energy-intensive industries by replacing traditional fossil fuel-based heating methods with advanced electric technologies. These industries rely on high-heat processes, which are critical for manufacturing products like rubber, ceramics, and plastics. By focusing on specific, high-heat applications, JOULIA seeks to showcase the potential of electrification to decarbonise operations, enhance efficiency, and drive sustainable industrial transformation.

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“The methodology for the Project synergies report of the JOULIA project (Grant Agreement number: **101192555**) leverages the extensive expertise, tools, and templates developed internally by White Research SRL. It incorporates European Commission guidelines and established best practices from relevant literature. This methodology builds on knowledge and approaches refined through White Research's involvement in previous projects, such as CORALIS (GA: **958337**). These elements have been tailored to meet the specific needs of JOULIA while ensuring compliance with EU recommendations and the conditions outlined in the Grant Agreement. This report outlines the adapted methodology as it was further developed and implemented within the JOULIA project.”

Contents

Executive Summary	8
1. Introduction	9
1.1 Scope and purpose	9
1.2 Contribution from partners	9
1.3 Relation to other project activity table.....	9
2. About JOULIA	10
2.1 Project goals, objectives and expected impact.....	10
3. JOULIA synergies with related project and initiatives	12
3.1 Introduction.....	12
3.1.1 The concept of synergies.....	12
3.1.2 Aims and objectives	12
3.2 Mapping of the ecosystem: projects, networks and initiatives	13
3.3 Synergies with projects and initiatives	16
3.3.1 Synergies with sister projects.....	16
3.3.2 CARBOWAVE	16
3.3.3 FLEXHYON.....	17
3.4 Synergies with other projects	18
3.4.1 METAWAVE	18
3.4.2 ModHEATech.....	19
3.4.3 eLITHE.....	20
3.4.4 eeethos	21
3.5 Relevant initiatives	23
3.5.1 HEATShift cluster	23
3.6 Planned activities and expected impact	25
Conclusions	26
Annex	27
Annex I - Indicative synergies	27

Table of Figures

Figure 1: JOULIA project ecosystem mapping.....	13
Figure 2: JOULIA newsletter and project website features of CARBOWAVE (left), CARBOWAVE example SMA feature of JOULIA and HEATShift cluster (right).....	17
Figure 3: Indicative JOULIA and FLEXHYON D&C activities and features.....	18
Figure 4: JOULIA and METAWAVE indicative D&C activities and features	19
Figure 5: ModHEATech feature in JOULIA website.....	20
Figure 6: JOULIA and eLITHE indicative D&C activities and features	21
Figure 7: JOULIA and eeethos indicative D&C activities and features	22
Figure 8: HEATShift cluster project ecosystem	23

List of Tables

Table 1: Abbreviations.....	7
Table 2: Contribution table	9
Table 3: Relation to other project activities	9
Table 4: JOULIA relevant initiatives, networks and proposed means of cooperation	14
Table 5: Established synergies summary	22

Abbreviations

Table 1: Abbreviations

D&C	Dissemination and Communication
EU	European Union
GA	Grant Agreement
GHG	Greenhouse gas
KPI	Key Performance Indicator
LCA	Life-cycle assessment
LCC	Life-cycle costing
No	Number
PPP	Public-Private Partnership
R&D	Research and Development
SME	Small-Medium Enterprise
TRL	Technology Readiness Level
WP	Work Package

Executive Summary

This document is the deliverable “**D14.3 – Project Synergies Report**” of the JOULIA project (Electrification of industrial processes using induction and microwave technologies). The report provides a structured overview of the project’s activities under **Task T14.3**, focusing on the identification, establishment and development of synergies with relevant EU-funded projects, initiatives and networks.

The report supports the effective positioning of JOULIA within the European industrial decarbonisation landscape by fostering collaboration, knowledge exchange and coordinated dissemination. In doing so, it contributes to maximising the project’s impact, enhancing the uptake of its results, and supporting its broader objective of advancing industrial electrification.

To support these objectives, the report maps the ecosystem of relevant projects and initiatives, identifies key collaboration opportunities, and documents the synergies established to date. Particular emphasis is placed on sister projects funded under the same Horizon Europe topic, as well as projects operating at the intersection of multiple thematic areas relevant to JOULIA, such as electric heating, flexibility, and digitalisation.

Synergy-building activities are coordinated by **White Research (WR)** with the support of all project partners and are continuously updated to reflect project progress and emerging collaboration opportunities. At the time of reporting (M1-M18), **6 out of 12 targeted synergy Key Performance Indicators (KPIs)** have already been achieved, demonstrating **strong early progress** in establishing collaboration pathways.

The report is structured around the following components:

- Definition of the concept of synergies and their relevance to JOULIA and Horizon Europe priorities.
- Presentation of the objectives and strategic approach of synergy-building activities.
- Mapping of the ecosystem of relevant projects, initiatives and networks based on key thematic dimensions.
- Identification and prioritisation of key projects for collaboration, including sister projects and high-relevance initiatives.
- Description of established synergies with selected projects (*CARBOWAVE, FLEXHYON, METAWAVE, ModHEATech, eLITHE, eeethos*).
- Overview of relevant initiatives, networks and clustering activities supporting collaboration.
- Presentation of planned joint activities, including dissemination, technical exchange and stakeholder engagement.
- Definition of expected impacts of synergies, including increased visibility, knowledge exchange and replication potential.

Overall, this report demonstrates how structured collaboration enhances JOULIA’s visibility, avoids duplication of efforts, strengthens technical development, and contributes to a more coherent and impactful European innovation ecosystem for industrial heat decarbonisation. This report will be **periodically updated** throughout the project lifecycle to reflect the evolving maturity of JOULIA activities and collaborations, with dedicated updates foreseen at **M36** and **M48**.

This deliverable has been prepared in accordance with the description provided in Annex 1 (Part A) of the Grant Agreement, with no deviations from the planned timeline or scope.

1. Introduction

1.1 Scope and purpose

This deliverable presents the outcomes of **Task T14.3**, which focuses on establishing and strengthening synergies between JOULIA and relevant projects, initiatives and networks at European, national and regional level. The objective is to ensure that JOULIA is embedded within a broader innovation ecosystem and actively contributes to, and benefits from, ongoing developments in industrial electrification and decarbonisation.

The report identifies key projects and initiatives with complementary objectives and approaches, analyses their relevance to JOULIA, and documents the collaboration activities initiated so far. It also outlines planned actions to further develop these synergies and maximise their impact throughout the project duration. As JOULIA progresses and project activities mature, this report will be periodically updated, with dedicated revisions planned for **M36** and **M48** to capture new collaborations, evolving stakeholder engagement, and additional synergies established during the implementation phase.

1.2 Contribution from partners

Table 2: Contribution table

Partner	Contribution
15. WR	WP leader. Deliverable writing.
7. KTH	Deliverable review.
1. CIRCE	Coordinator. Deliverable quality review.

1.3 Relation to other project activity table

Table 3: Relation to other project activities

Task	Relation to other project activities
T14.3	Horizontal task

2. About JOULIA

The industrial sector is **heavily dependent on fossil fuels for heating**, accounting for **40% of global CO₂ emissions**. This reliance, coupled with **inefficient heating systems**, leads to substantial energy losses and **hinders progress toward climate neutrality**. Medium-to high-temperature processes, essential in industries like **rubber and plastics**, offer significant potential for electrification, enabling both emissions reduction and improved energy efficiency.

To meet the EU's ambitious climate targets, such as the **Fit for 55 package**, the **REPowerEU Plan**, and the **Net-Zero Industry Act**, a shift to cleaner, more efficient, and flexible heating technologies is essential for the industrial sector. However, challenges such as diverse process and material requirements, along with international competition create barriers to the adoption of clean heating technologies.

JOULIA aims to **accelerate the energy transition in the industrial sector by demonstrating two innovative electric heating processes** that enhance flexibility, energy efficiency, and renewable energy integration.

By leveraging induction and microwave heating, JOULIA aims to decarbonise process and energy-intensive industries, significantly improve energy efficiency, enhance sustainability, strengthen the sector's resilience and competitiveness and contribute to the EU's climate objectives.

2.1 Project goals, objectives and expected impact

The JOULIA project aims to transform industrial heating processes by **transitioning from fossil fuel-based methods to innovative electric technologies**. Its overarching objective is to design, implement, and demonstrate highly efficient electromagnetic heating systems (**using induction and microwave technologies**) for medium-to-high temperature processes (100-500°C), ensuring flexibility to adapt to fluctuating renewable energy supplies. The **specific goals** that will enable JOULIA's main objective are described below:

1. Development of electric heating systems

JOULIA will develop safe, efficient electric heating technologies to replace fossil fuel systems in the rubber and plastic industries. Two specific processes, rubber vulcanisation and multilayer pipe gluing, will employ induction and microwave technologies. These systems will undergo rigorous testing to ensure scalability, safety, and economic viability.

2. Integration of digital tools for flexibility and safety

The project will design and develop digital tools to enhance the flexibility, reliability, and safety of its heating systems. These tools will optimise energy consumption by aligning with fluctuating renewable energy supplies and market prices. Additionally, predictive maintenance systems will monitor performance, ensuring safety and minimising risks, while real-time life cycle assessments (LCA) will evaluate environmental and economic impacts.

3. Validation and demonstration of technologies

The project will conduct demonstrations at two industrial sites to validate the technologies up to Technology Readiness Level (TRL) 7. The systems will undergo long-term trials in real industrial settings, including a retrofitted induction heating system for rubber vulcanisation and a microwave-based pipe gluing process. Performance, safety, and sustainability benchmarks will be assessed to ensure industrial applicability.

4. Roadmap for replication and scale-up

JOULIA will develop a comprehensive roadmap to replicate and scale up these technologies across sectors such as food and ceramics. This includes cost assessments, regulatory reviews, and identifying barriers to adoption. Training materials will be developed, and the project will provide recommendations for stakeholders to promote sustainable electrification.

5. Strategic communication and exploitation

To maximise impact, JOULIA will engage with industry, SMEs, public bodies, and other stakeholders, ensuring widespread dissemination of results. It will establish business-oriented commercialisation plans, connect with related EU and global initiatives, and contribute to policy recommendations, fostering a sustainable transition to electrified heating processes.

By advancing decarbonised heating systems and promoting renewable energy integration, JOULIA paves the way towards a more sustainable and energy-efficient future for European industries. The expected impact of the JOULIA project aligns with European energy and climate goals, focusing on sustainability, efficiency, and competitiveness. **Key impacts include:**

- **Scientific impact:** The JOULIA project will contribute to advancing knowledge in the field of induction and microwave heating systems, fostering the development of new research and development (R&D) lines and opportunities. By enhancing the understanding of the performance and applicability of these heating technologies in industrial processes, the project will facilitate the emergence of new multidisciplinary research areas, activities, and projects, driving innovation in this field.
- **Societal impact:** The project is expected to have a significant positive impact on climate change mitigation by enabling the cost-effective decarbonisation of various industrial sectors within the EU. Additionally, JOULIA will contribute to the creation of new professional career pathways and employment opportunities in a highly specialised and technologically advanced sector, supporting talent retention and attraction in a strategically important field.
- **Economic and technological impact:** JOULIA will play a crucial role in sustaining the competitiveness of European industry in the context of evolving regulatory frameworks, while ensuring continued economic growth. By fostering a more resilient and energy-independent industrial landscape, the project will reduce exposure to price volatility and resource shortages. Furthermore, it will accelerate the green and digital transition, contributing to the overarching goal of decarbonising European industry.

JOULIA represents a transformative step towards sustainable industrial heating, combining innovative technologies, renewable energy integration, and strategic collaboration to drive Europe's transition to a decarbonised, energy-efficient, and independent future.

3. JOULIA synergies with related project and initiatives

3.1 Introduction

3.1.1 The concept of synergies

In the context of this deliverable, **synergies are understood as formal, regular and purposeful forms of collaboration between JOULIA and complementary projects, initiatives and networks** that can increase the reach, quality and exploitation potential of project results as well as contributing to EU's priorities¹. For JOULIA, synergies therefore go beyond simple mutual promotion and include technical exchange, coordinated stakeholder engagement, mutual learning on safety and validation, alignment of assessment methods, and joint reflection on replication, standardisation and market uptake.

Synergies are especially relevant for JOULIA because industrial heat decarbonisation is not advancing through a single technology pathway. The current European portfolio combines electromagnetic heating, hybrid electrification, high-temperature heat pumps, digital twins, smart control, circularity-oriented design and renewable integration across several sectors. This diversity makes collaboration valuable: **it enables JOULIA to benchmark its induction- and microwave-based solutions against other electrification routes, identify transferable lessons, and position its results within a broader European transition toward flexible, low-carbon process heat.**

3.1.2 Aims and objectives

The overarching aim of JOULIA's synergy work is to establish a continuous communication pathway with **(former and) ongoing projects and with relevant European, national and regional initiatives working on industrial electrification, process flexibility, renewable integration, digitalisation and industrial decarbonisation**. The purpose is to ensure that JOULIA does not operate in isolation, but rather as part of a wider innovation ecosystem capable of accelerating the uptake of clean industrial heating solutions.

More specifically, the objectives of the synergy activity are fivefold:

1. It aims to identify and maintain a living map of projects and initiatives whose technologies, sectors, methods or stakeholder communities are relevant and complementary to JOULIA.
2. It seeks to establish regular interaction with these actors through bilateral contacts, cluster activities and participation in each other's public events.
3. It aims to convert networking into concrete joint actions, such as co-organised communication and dissemination activities, feedback exchange, cross-participation in workshops, and coordinated outreach to industrial and policy stakeholders.
4. It seeks to strengthen the exploitation and replication potential of JOULIA results through comparison of techno-economic, environmental, regulatory and market insights across sectors.
5. It aims to systematise the knowledge generated through these contacts so that it can inform future project activities and feed the TRUST database.

¹ **European Commission** (n.d.), *European Partnerships in Horizon Europe*, Available at: [link](#)

3.2 Mapping of the ecosystem: projects, networks and initiatives

To better position JOULIA within the broader European landscape of industrial heat decarbonisation, this section maps the most relevant (former and) ongoing EU projects and initiatives with complementary technological, methodological and systemic features. As JOULIA addresses not only alternative electric heating technologies but also matters of flexibility, renewable integration, safety and industrial applicability, the ecosystem has been organised around three cross-cutting thematic dimensions: **(1) electromagnetic, (hybrid) electric heating**, **(2) heat pumps, heat upgrade and recovery**, and **(3) flexibility, storage, digital integration**.

Initial outreach focused on projects located at the **intersection of these thematic dimensions**, as well as on **sister projects**, meaning those funded under the same call² as JOULIA (*CARBOWAVE* and *FLEXHYON*). These projects are considered the most relevant from a synergies perspective, as they address multiple aspects that are central to JOULIA and can therefore provide particularly valuable insights into technology performance, system integration, operational flexibility, and replication potential across sectors. The thematic mapping shown in **Figure 1** thus helps identify not only projects that are technologically close to JOULIA, but also those that are complementary in ways that can strengthen collaboration and expected impact on industrial heat decarbonisation. Full list of identified projects and details can be found in **Annex**.

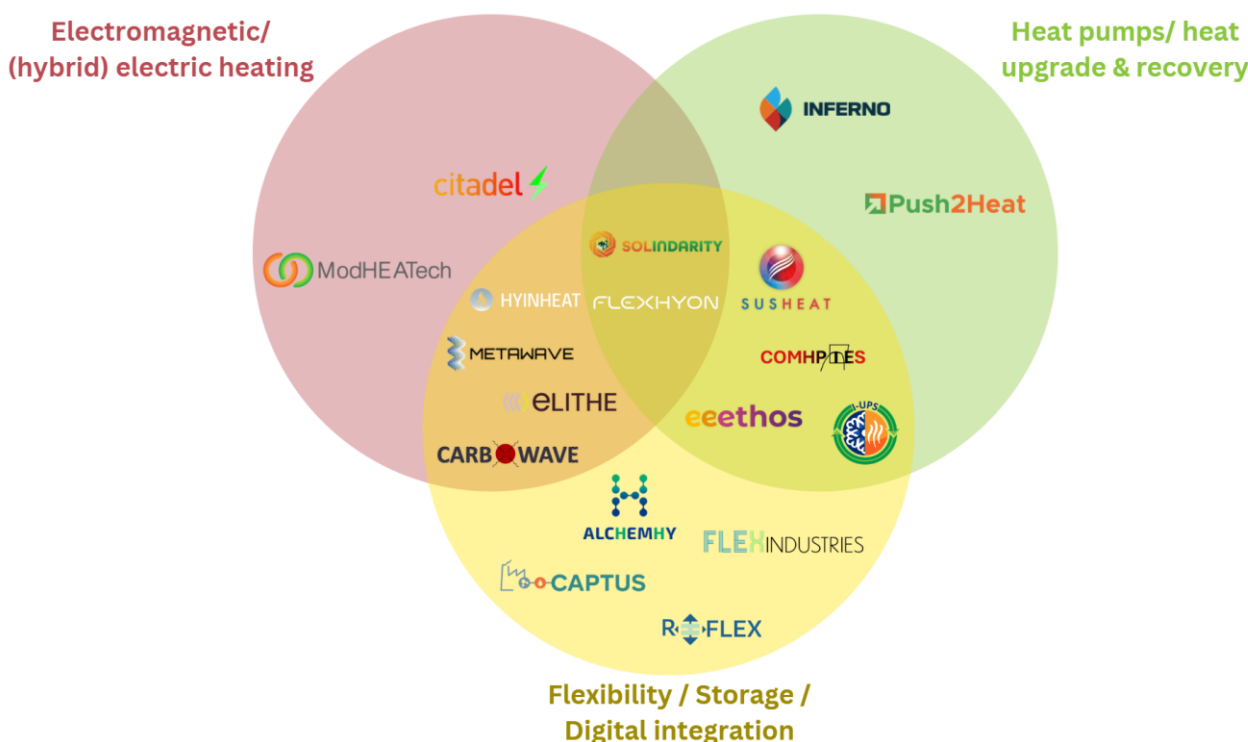


Figure 1: JOULIA project ecosystem mapping

² HORIZON-CL5-2024-D4-01-03: Alternative heating systems for efficient, flexible and electrified heat generation in industry

Beyond the individual R&D projects, JOULIA is also embedded in a broader landscape of **initiatives, networks and policy frameworks** that play an important role in enabling and fostering synergies. Table 4: JOULIA relevant initiatives, networks **Table 4** presents a non-exhaustive list of relevant initiatives and networks with which JOULIA has already established, or plans to establish, contact. Collaboration and engagement with these initiatives are expected to further strengthen as the project advances, technical results become more mature, and opportunities for synergies, knowledge exchange, and joint dissemination activities continue to expand.

Table 4: JOULIA relevant initiatives, networks and proposed means of cooperation

Name	Type	Description	Means of cooperation
<u>A.SPIRE</u>	European industrial association	A.SPIRE represents energy-intensive industries and is implementing the Processes4Planet partnership. It promotes innovation for resource and energy efficiency and industrial decarbonisation.	Participation in events, alignment with strategic priorities, dissemination of JOULIA results to industrial stakeholders
<u>Process4Planet</u>	Co-programmed European Partnership	EU partnership aiming at transforming process industries towards climate neutrality, circularity and competitiveness. Supports large-scale industrial innovation projects.	Knowledge exchange, participation in clustering activities,
<u>Hubs4Circularity</u>	EU initiative / network	Initiative supporting the development of large-scale circular industrial hubs across Europe, focusing on resource efficiency and industrial symbiosis.	Exploration of replication opportunities, cross-sector collaboration, dissemination to circular economy stakeholders
<u>European Microwave Association</u>	Scientific / technical association	Organisation promoting the development and application of microwave technologies across academia and industry.	Technical exchange, dissemination of results, participation in conferences and workshops
<u>Alliance of Energy-Intensive Industries</u>	Industry alliance	Represents energy-intensive sectors at EU level, advocating for policies supporting competitiveness and decarbonisation.	Policy dialogue, dissemination of project results, contribution to policy recommendations
<u>Ceramy-Unie</u>	European industry association	Represents the European ceramic industry, including sectors highly relevant for electrification and high-temperature processes.	Stakeholder engagement, dissemination, identification of replication opportunities in ceramics
<u>Cepi</u>	European industry association	Represents the pulp and paper sector, which is highly relevant for industrial heat decarbonisation and electrification.	Outreach to sector stakeholders, exchange on electrification challenges, replication potential
<u>2cool2waste</u>	EU-funded projects cluster	Project cluster focused on industrial waste heat recovery and utilisation through innovative cooling and energy integration solutions.	Knowledge exchange on heat recovery, joint dissemination, exploration of complementary solutions

<u>CEFIC</u>	European industry association	The European Chemical Industry Council representing the chemical sector in Europe, with strong involvement in industrial transformation, energy efficiency, and low-carbon technologies.	Dissemination to chemical industry stakeholders, exchange on electrification and decarbonisation pathways, collaboration on policy and innovation discussions
<u>CEMBUREAU</u>	European industry association	Represents the European cement industry and supports the transition towards climate neutrality through innovation and carbon reduction technologies.	Exchange on high-temperature industrial electrification, dissemination of project outcomes, identification of replication opportunities in cement production
<u>SolarPower Europe</u>	European renewable energy association	Association representing the European solar power sector, promoting solar energy deployment and integration into industrial energy systems.	Exchange on renewable electricity integration, dissemination to renewable energy stakeholders, exploration of synergies for industrial electrification
<u>ENTSO-E</u>	European network organisation	European Network of Transmission System Operators for Electricity, coordinating electricity transmission and supporting the integration of renewable energy and electrification across Europe.	Exchange on grid integration aspects, dissemination of electrification scenarios, dialogue on industrial electricity demand and flexibility
<u>Eurelectric</u>	European industry association	Federation representing the European electricity industry, including utilities and electricity providers committed to decarbonisation and electrification.	Dissemination to electricity sector stakeholders, exchange on electrification strategies, participation in policy and market discussions
<u>European Energy Research Alliance (EERA)</u>	European research alliance	Network of research organisations collaborating on low-carbon energy technologies and supporting Europe's energy transition.	Scientific collaboration, knowledge exchange, dissemination through research networks, identification of synergies with ongoing initiatives
<u>Mission Innovation (MI) 2.0</u>	Global clean energy initiative	International initiative accelerating clean energy innovation through collaboration between governments, industry, and research actors.	Dissemination of project innovations, contribution to clean energy innovation dialogue, exploration of international cooperation opportunities
<u>Directorate-General for Energy (DG ENER)</u>	European Commission Directorate-General	European Commission department responsible for EU energy policy, including energy transition, electrification, and industrial decarbonisation.	Policy dialogue, contribution to EU energy transition discussions, dissemination of project policy-relevant results

European Environment Agency (EEA)	EU agency	Agency providing independent information on the environment and climate, supporting evidence-based policymaking in Europe.	Exchange of knowledge on environmental impacts and indicators, dissemination of project outcomes relevant to sustainability and decarbonisation
Directorate-General for Climate Action (DG CLIMA)	European Commission Directorate-General	European Commission department leading EU policy on climate action and greenhouse gas emissions reduction.	Contribution to climate policy discussions, dissemination of decarbonisation results, alignment with EU climate objectives

3.3 Synergies with projects and initiatives

3.3.1 Synergies with sister projects

3.3.2 CARBOWAVE

CARBOWAVE (Horizon Europe, GA No. 101192581) introduces alternative heating methods, plasma and microwave heating, to replace conventional energy-intensive industrial processes. The project aims to reduce energy consumption, carbon emissions, and production costs by developing atmospheric plasma for PAN stabilisation and a susceptor-induced microwave heating technology for carbon fiber production. These advancements have the potential to transform the construction, wind energy, and EV industries, reinforcing Europe’s competitive edge in the global carbon materials market.

Initial contact between JOULIA and CARBOWAVE was established on 20 March 2025. Early discussions led to the joint proposal to form a collaboration cluster, later named “HEATShift”, aimed at fostering coordinated dissemination, communication activities, and technical exchange among projects working on clean industrial heating.

Since then, collaboration between the two projects has been actively developed. JOULIA has featured CARBOWAVE through its website, newsletters, and social media channels, while reciprocal dissemination actions have also been undertaken. In addition, regular exchanges take place within the framework of the HEATShift cluster. Further details on these joint activities are provided in **Section 3.5.1** of this report.

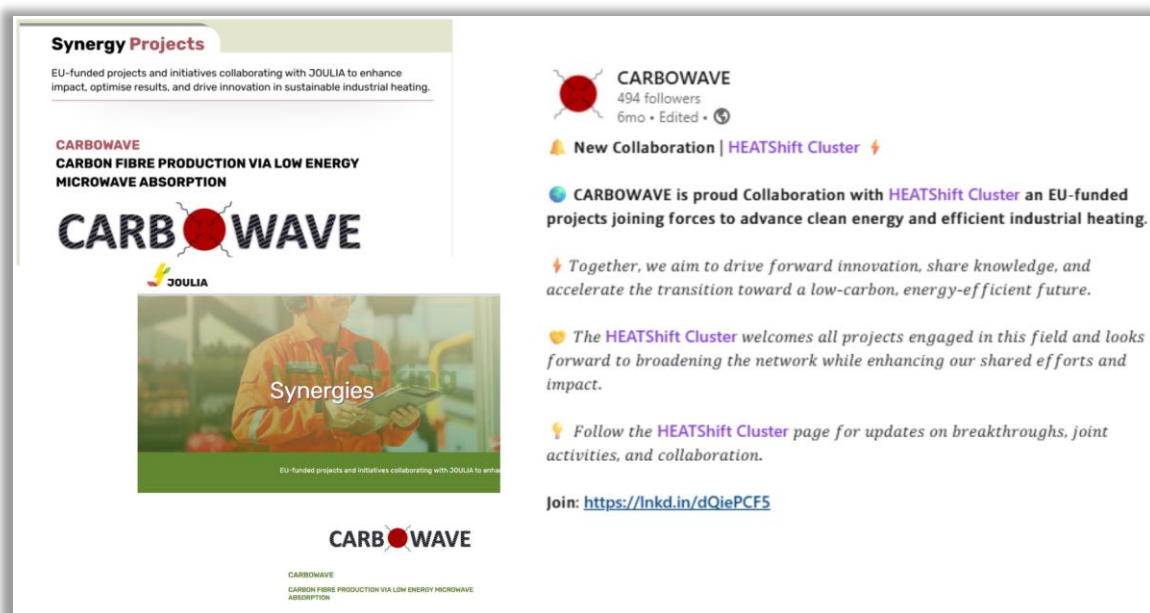


Figure 2: JOULIA newsletter and project website features of CARBOWAVE (left), CARBOWAVE example SMA feature of JOULIA and HEATShift cluster (right)

3.3.3 FLEXHYON

FLEXHYON (Horizon Europe, GA No. 101192990) focuses on enhancing energy efficiency and reducing carbon emissions in industry through fully electrified heating systems (microwave, heat pumps, ultrasound) for key industrial processes such as drying compact and granular materials, as well as distillation/extraction. The project will demonstrate optimised prototypes in ceramics, feed production, and biomass industries, assessing economic impact (LCA, LCC) and validating environmental, technical, and safety performance.

Initial contact between JOULIA and FLEXHYON was established on 31 March 2025. Following this, FLEXHYON joined the HEATShift cluster, strengthening collaboration among projects working on clean industrial heating solutions. Since then, JOULIA has featured FLEXHYON through its newsletters, and social media channels, with reciprocal dissemination actions also taking place. In addition, regular exchanges are carried out within the framework of the HEATShift cluster. Further details on these joint activities are provided in **Section 3.5.1** of this document.

As FLEXHYON follows a similar timeline to JOULIA (2025-2028), both projects are currently progressing through comparable implementation and demonstration phases, enabling continuous exchange of results, alignment of activities, and the development of joint dissemination and exploitation actions throughout their lifecycle.

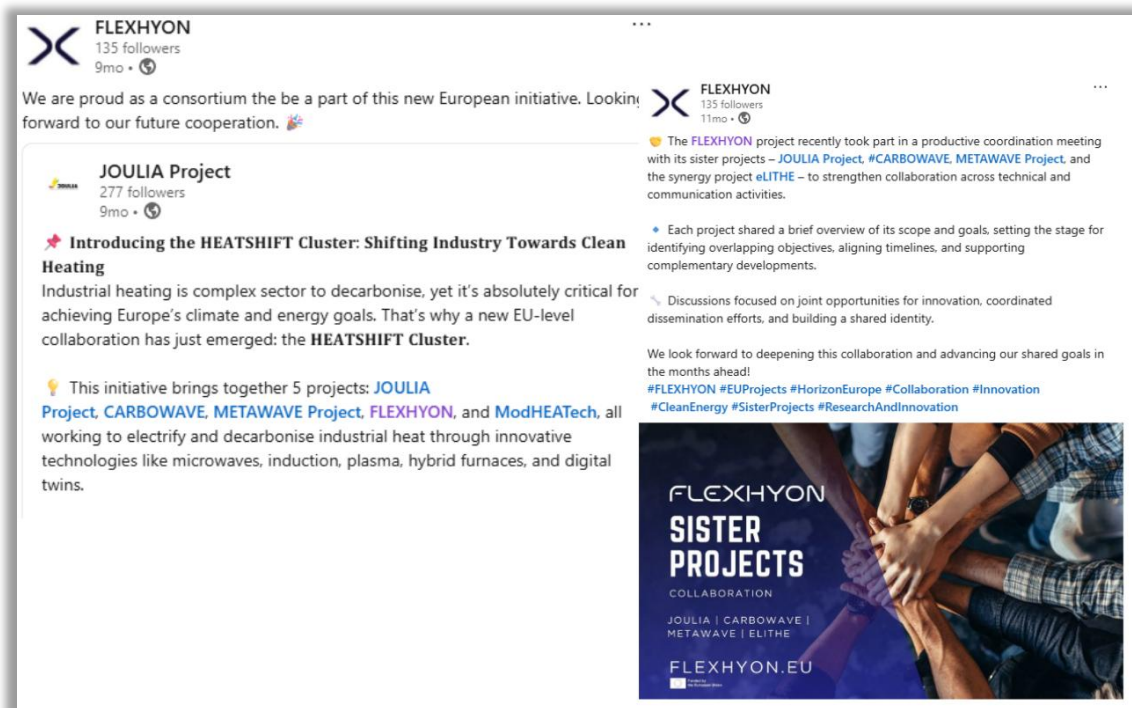


Figure 3: Indicative JOULIA and FLEXHYON D&C activities and features

3.4 Synergies with other projects

3.4.1 METAWAVE

METAWAVE (Horizon Europe, GA No. 101138476) proposes the introduction of advanced microwave-based heating systems in high-temperature heating processes. Its key outcome is the demonstration of these systems in three industrial sectors (ceramics, asphalt, aluminium) achieving superior performance. Process efficiency, energy use, GHG emissions and productivity are the main metrics that define the positioning of the project results on the industrial innovation atlas. The advantages of higher system efficiency, shorter process time and process controllability have the potential of bringing the twin-transition one step closer, helping the process industries to reduce the energy demand and leverage their overall flexibility. Further optimisation requires feedstock enhancement with novel nanostructured additives, waste-based refractories for advanced process monitoring and controls as well as robust modelling and predictive functions for the Process Digital Twin.

Initial contact between JOULIA and METAWAVE was established in April 2025, followed by METAWAVE joining the HEATShift cluster, further strengthening collaboration among projects working on clean industrial heating solutions. Since then, cooperation has been developed through dissemination and communication activities, including mutual promotion via project channels.

In addition, METAWAVE has supported JOULIA's activities under **"Task 4.4 - Mapping challenges, perceptions and needs of stakeholders on the adoption of induction and microwaves heating technologies"** by contributing to the assessment of stakeholder perceptions, enablers and barriers related to industrial electrification, providing input through an expert interview. Further opportunities for

collaboration are being explored, particularly in relation to technical exchange on microwave heating technologies, digital tools and process optimisation. Given that METAWAVE (2024-2027) started slightly earlier than JOULIA, it is already advancing into more mature development and demonstration phases, allowing JOULIA to benefit from early lessons learned while enabling continued collaboration during overlapping implementation and validation stages.

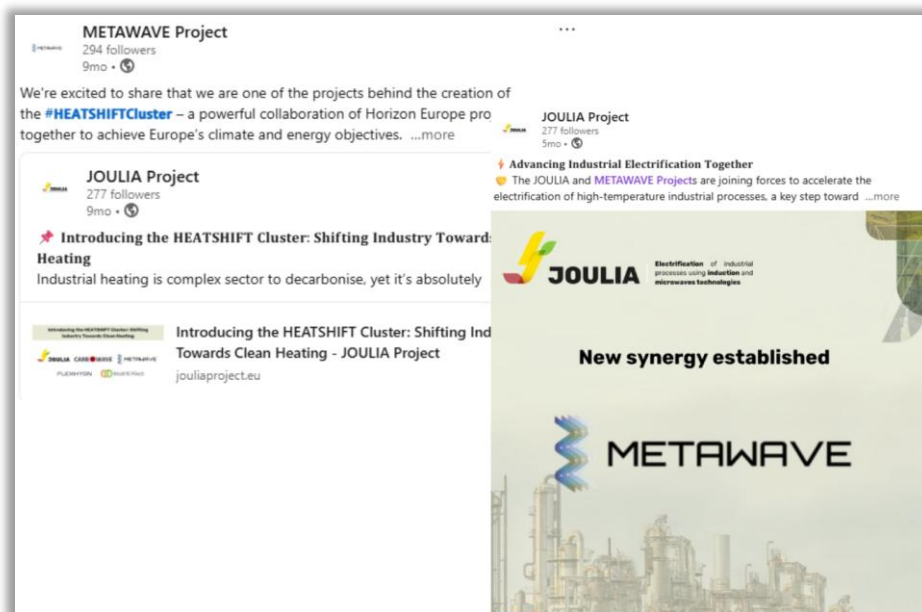


Figure 4: JOULIA and METAWAVE indicative D&C activities and features

3.4.2 ModHEATech

The **ModHEATech** (Horizon Europe, GA No. 101092234) project is working to reduce the carbon footprint of the steel industry by developing an innovative hybrid heating system for reheating furnaces, a key energy-intensive step in downstream steel production. Currently, these furnaces rely heavily on methane (CH_4) burners, which result in high CO_2 emissions. ModHEATech proposes a new solution: combining traditional gas burners with electrification using induction heating. This “hybrid heating” approach allows the system to optimise energy use, improve efficiency, and significantly cut emissions. The hybrid system will also include a heat recovery component that captures and reuses energy from furnace off-gases. Importantly, the electricity used to power the induction system will come from renewable energy sources, making the process cleaner and more sustainable.

Initial contact between JOULIA and ModHEATech was established on 3 April 2025, followed by ModHEATech joining the HEATShift cluster, reinforcing collaboration among projects working on clean industrial heating solutions. Since then, cooperation has been developed through joint dissemination and communication activities, including mutual promotion via project channels, as well as regular exchanges within the framework of the HEATSHIFT cluster. Further details on these joint activities are provided in **Section 3.5.1** of this document. As ModHEATech (2023-2027) is more advanced in its implementation phase compared to JOULIA, cooperation allows JOULIA to leverage existing knowledge and early results, while still maintaining alignment during the remaining overlapping period for joint dissemination and exchange activities.

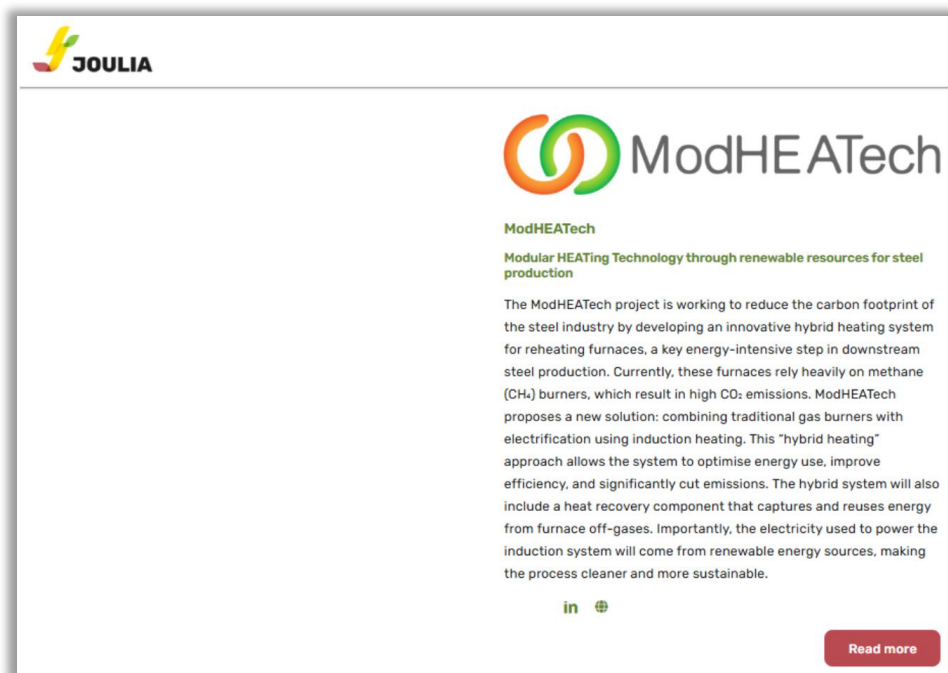


Figure 5: ModHEATech feature in JOULIA website

3.4.3 eLITHE

eLITHE (Horizon Europe, GA No. 101138325) aims to decarbonise the ceramic industry by demonstrating sustainable and cost-effective solutions for the electrification of high-temperature processes such as melting, calcination, and firing, which currently rely heavily on fossil fuels. The project will pilot three types of electric furnaces, including a hybrid kiln combining electricity and hydrogen. In parallel, eLITHE develops innovative material compositions, circular energy storage solutions, and digital tools to optimise energy management and process performance. Through these advancements, the project is expected to achieve significant emissions reductions, estimated at over 97,000 tonnes of CO₂ per year, thereby contributing to the EU's objectives for climate neutrality, cleaner industry, and energy independence.

Initial contact between JOULIA and eLITHE was established on 16 September 2025, followed by eLITHE joining the HEATShift cluster, strengthening collaboration among projects working on clean industrial heating. Since then, cooperation has focused primarily on dissemination and communication activities, including mutual promotion of project events and initiatives. Further collaboration opportunities are expected to be explored as the project progresses. With a timeline closely aligned to JOULIA (2024-2027), eLITHE is progressing through similar development and demonstration phases, facilitating parallel exchange of knowledge and coordinated dissemination activities, with potential for deeper technical collaboration as both projects mature.

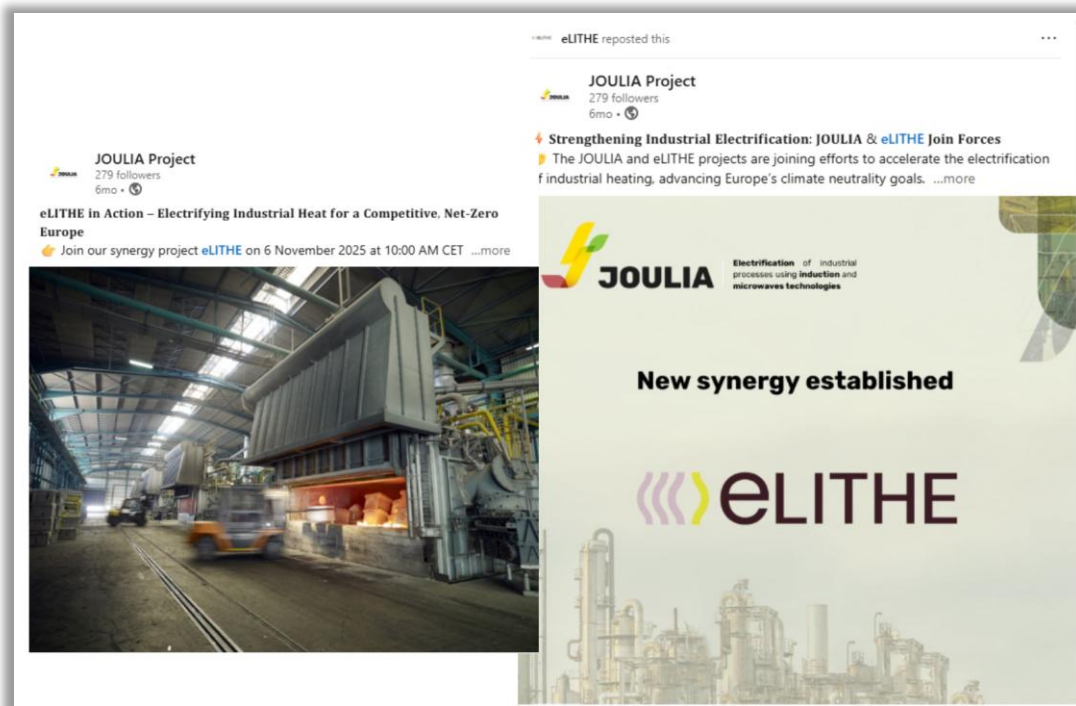


Figure 6: JOULIA and eLITHE indicative D&C activities and features

3.4.4 eeethos

eeethos (Horizon Europe, GA No. 101178624) focuses on advancing electrification and energy efficiency as key enablers for a sustainable, resilient, and competitive European industry. The project develops and demonstrates innovative solutions to support the decarbonisation of energy-intensive sectors such as asphalt, pulp and paper, steel, and bricks. By integrating advanced electrification technologies, heat recovery systems, and digital tools, eeethos contributes to accelerating the green transition of industrial processes.

Initial contact between JOULIA and eeethos was established on 29 January 2026. As collaboration is still at an early stage, discussions have focused on exploring potential synergies, particularly through existing clustering activities. In this context, opportunities for cooperation have been identified within the 2cool2waste cluster, a collaboration of EU-funded projects working on innovative heating and cooling solutions.

The 2cool2waste cluster aims to advance thermal energy management, heat recovery, and industrial decarbonisation through joint activities such as co-organisation of events, preparation of joint briefings, and coordinated dissemination actions (e.g. newsletters and communication campaigns). Given the significant untapped potential of the heating and cooling sector for emissions reduction and energy efficiency improvements, such collaborative efforts are expected to support knowledge exchange, increase visibility, and contribute to the broader uptake of innovative solutions. Further collaboration between JOULIA and eeethos is expected to develop as both projects progress.

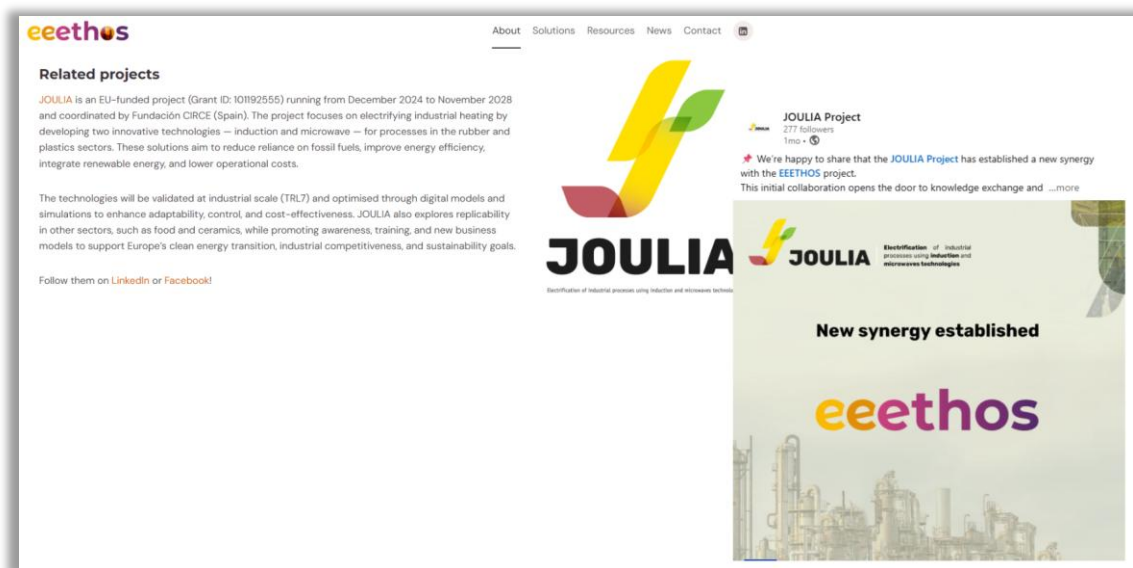


Figure 7: JOULIA and eeethos indicative D&C activities and features

Table 5: Established synergies summary

Project	Description	Duration	Synergies/ Contributions to JOULIA
CARBOWAVE	Introduces plasma and microwave heating to replace energy-intensive industrial processes, reducing energy use, emissions, and costs, particularly in carbon fibre production.	Jan 2025 – Dec 2028	Synergies through HEATShift clustering activities, including joint dissemination, communication, and knowledge exchange.
FLEXHYON	Develops fully electrified heating systems (microwave, heat pumps, ultrasound) to improve energy efficiency and reduce emissions in industrial processes.	Jan 2025 – Jun 2028	Synergies through HEATShift clustering activities, including joint dissemination, communication, and knowledge exchange.
METAWAVE	Integrates microwave-based heating systems to improve energy efficiency and reduce emissions in industries like ceramics, asphalt, and aluminium.	Jan 2024 – Dec 2027	Contributed directly to Task 4.4 – “Mapping challenges, perceptions and needs of stakeholders on the adoption of induction and microwaves heating technologies” through expert input on stakeholder perceptions, barriers, and enablers related to industrial electrification. Additional collaboration includes dissemination and technical exchange activities.

eLITHE	Develops sustainable electrification pathways for high-temperature heating in ceramics, including electric kilns and energy management tools.	Jan 2024 – Dec 2027	Synergies through HEATShift clustering activities, including joint dissemination, communication, and knowledge exchange.
eeethos	Develops technologies like high-temperature heat pumps and digital twins to decarbonize industrial heating across multiple sectors.	Nov 2024 – Oct 2028	Initial collaboration linked to dissemination, clustering, and knowledge exchange activities
ModHEATech	Focuses on decarbonisation, based on the introduction of hybrid heating technology, based on electrification and gas-burning properly combined.	Mar 2023 – Mar 2026	Synergies through HEATShift clustering activities, including joint dissemination, communication, and knowledge exchange.

3.5 Relevant initiatives

3.5.1 HEATShift cluster

The **HEATShift Cluster** is a collaborative initiative bringing together six Horizon Europe-funded projects, **JOULIA**, **CARBOWAVE**, **METAWAVE**, **FLEXHYON**, **eLITHE** and **ModHEATech**, all working towards a common objective: advancing the electrification and decarbonisation of industrial heating processes across Europe. The cluster focuses on promoting clean and efficient heating solutions by combining innovations in **induction, microwave, and hybrid heating technologies**, addressing key challenges in energy-intensive industries.

The collaboration was initiated in **April 2025** following bilateral exchanges between JOULIA and CARBOWAVE, which identified strong complementarities and the need for a structured platform to coordinate joint activities. This led to the formation of the HEATShift cluster, which has since expanded to include additional relevant projects working on alternative heating technologies.

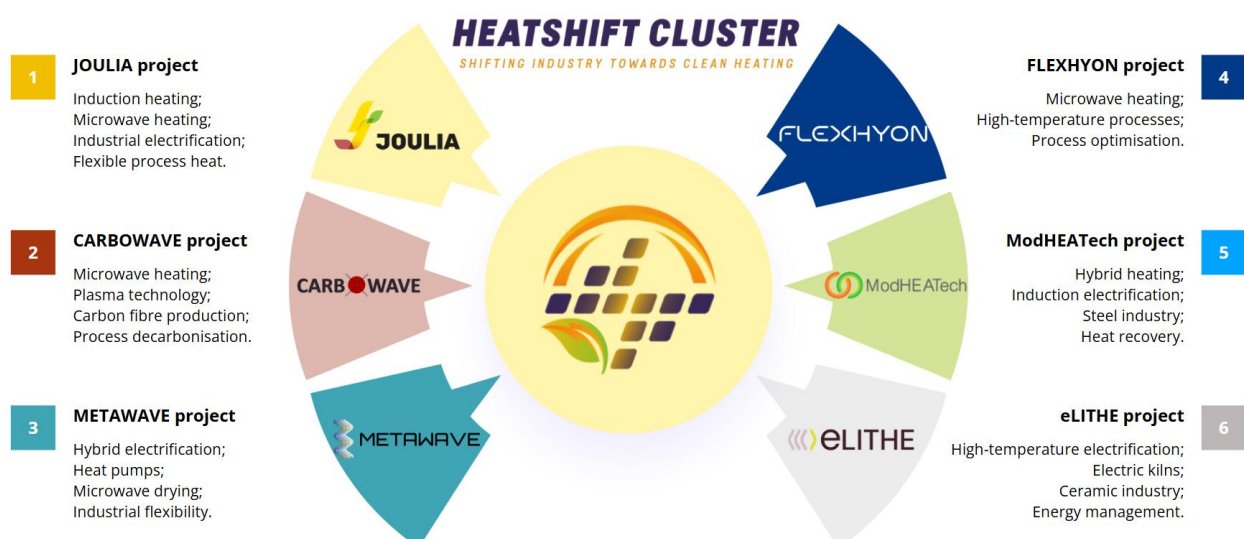


Figure 8: HEATShift cluster project ecosystem

The main objectives of the HEATShift cluster include:

- Strengthening collaboration among projects working on industrial electrification and clean heating technologies.
- Enhancing the visibility, impact and outreach of project results through coordinated dissemination and communication activities.
- Facilitating knowledge exchange on technical, methodological and operational aspects of industrial heating solutions.
- Supporting alignment of approaches related to performance assessment, safety, flexibility and system integration.
- Promoting the replication and transferability of innovative heating and electrification solutions across different industrial sectors, enabling cross-sector learning in diverse industrial environments.
- Contributing to the broader goal of accelerating the decarbonisation of energy-intensive industries in Europe.

Since its establishment, the HEATShift cluster has enabled regular interaction among participating projects through **periodic meetings**, fostering discussions on collaboration opportunities, joint activities and shared challenges. These exchanges have led to the identification of several areas of cooperation, including:

- **Joint dissemination activities**, such as cross-promotion of project results via websites, newsletters and social media channels (including a dedicated LinkedIn presence).
- **Exchange of information on events and opportunities**, supported by a shared repository where partners contribute relevant conferences, workshops and stakeholder engagement opportunities.
- **Exploration of co-organised events**, including workshops and conference sessions aimed at showcasing project results and fostering dialogue with industrial stakeholders.
- **Mutual support in communication activities**, including the promotion of key milestones, publications and project outputs across partner networks.
- **Initial technical exchanges**, enabling discussion of common challenges and solutions related to industrial electrification, heating technologies and system integration.

The HEATShift cluster is therefore not only a dissemination platform but also a **dynamic collaboration mechanism**, supporting both communication and technical interaction among projects. By enabling continuous exchange and coordinated action, it contributes to reducing fragmentation in the field and maximising the collective impact of participating projects.

The collaboration is ongoing and expected to evolve further as projects progress, with increasing emphasis on joint events, stakeholder engagement and alignment on exploitation and policy-related aspects.

3.6 Planned activities and expected impact

The synergy-building approach of JOULIA is based on a set of targeted and complementary activities aimed at maximising collaboration efficiency and project impact as elaborated in the project's **Dissemination and Communication Plan (DCP)**.

Planned activities include:

- **Joint dissemination and communication**, including cross-promotion of results, coordinated social media campaigns, shared newsletters, and participation in common events to increase visibility and outreach.
- **Participation in clustering activities**, such as the HEATShift cluster and 2cool2waste, enabling structured interaction and alignment with related projects.
- **Technical exchange and knowledge sharing**, focusing on process performance, safety, digitalisation, flexibility and assessment methodologies.
- **Stakeholder engagement and network expansion**, including exchange of contacts, cross-participation in workshops and events, and outreach to industrial and policy stakeholders.
- **Exploration of joint activities**, such as co-organised workshops, webinars, and collaborative dissemination materials.
- **Alignment on exploitation and policy aspects**, including exchange of insights on market barriers, regulatory frameworks and replication potential.
- **Systematic documentation of synergies**, including interactions, outcomes and lessons learned, feeding into the TRUST database.

These activities are designed to ensure **efficient use of resources**, avoiding duplication of efforts across projects while fostering complementarity. By aligning approaches and sharing knowledge, JOULIA benefits from existing expertise and accelerates its own development and validation processes.

From an impact perspective, synergy-building contributes to:

- **Increased visibility and outreach**, reaching wider and more diverse stakeholder groups.
- **Improved quality of project outputs**, through benchmarking and exchange of best practices.
- **Faster uptake and replication of solutions**, supported by cross-sector knowledge transfer.
- **Stronger alignment with EU priorities and policy frameworks**, reinforcing the relevance of project results.
- **Multiplication of impact**, as coordinated actions maximise results beyond the scope of individual projects.
- **Reduced fragmentation within the ecosystem**, contributing to a more coherent and effective European innovation landscape.

Overall, synergies act as a key enabler for maximising JOULIA's impact, supporting both the achievement of its objectives and its contribution to the broader transition towards decarbonised industrial heating.

Conclusions

This report demonstrates that JOULIA is actively embedded within a dynamic European ecosystem of projects and initiatives addressing the electrification and decarbonisation of industrial heat. The mapping and analysis conducted confirm strong complementarities between JOULIA and a range of ongoing Horizon Europe projects, particularly those focusing on alternative heating technologies, system flexibility and digitalisation.

Through **Task 14.3**, JOULIA has successfully initiated and structured collaboration with key projects, notably within the HEATShift cluster, while also exploring synergies with broader initiatives and networks. These interactions have already resulted in joint dissemination activities, participation in clustering efforts, and initial technical exchanges.

The alignment in timelines between JOULIA and several of the identified projects has proven particularly valuable, enabling continuous collaboration throughout implementation and demonstration phases. At the same time, engagement with more advanced projects has provided access to early insights and lessons learned, supporting JOULIA's own development and validation activities.

The progress achieved to date is reflected in the attainment of already **6 out of 12 targeted synergy KPIs**, indicating **already a strong start** in establishing meaningful and structured collaboration pathways.

Looking ahead, the continued development of these synergies will be essential to maximise JOULIA's impact. By strengthening cooperation across projects and initiatives, JOULIA contributes to reducing fragmentation, enhancing knowledge exchange, and supporting the wider uptake of innovative solutions.

Overall, synergy-building represents a key strategic enabler for JOULIA, supporting efficient use of resources, alignment of efforts, and multiplication of impact, while reinforcing the project's contribution to Europe's transition towards a sustainable, competitive and climate-neutral industrial sector.

Annex

Annex I - Indicative synergies

Project	Description	JOULIA Partners involved	Duration
<u>FLEXHYON</u>	Recognising the significance of energy efficiency in industry and carbon emissions reduction, FLEXHYON proposes a combination of fully electrified heating systems (microwave, heat pumps, ultrasound) to transition industrial processes (e.g., drying, distillation) from fossil to renewable and low-carbon energy sources. It includes building and demonstrating three prototypes in ceramics, feed production, and biomass industries. The project also focuses on scalability, environmental performance, and market strategies for deployment.	CEI	Jan 2025 – Jun 2028
<u>CARBOWAVE</u>	Deploys alternative heating technologies like microwave and plasma heating for carbon fibre production. The project aims to drastically reduce energy consumption, carbon emissions, and production costs, making carbon fibres more accessible for use in wind energy, electric vehicles, and construction industries. It includes developing new susceptor-induced microwave heating and plasma stabilisation techniques for energy-intensive processes.	n/a	Jan 2025 – Dec 2028
<u>eLITHE</u>	Development of sustainable and cost-effective electrification pathways for high-temperature heating processes in the ceramic industry. Includes piloting electric and hybrid kilns, developing circular energy storage solutions, and creating digital tools for energy management. Targets a reduction of over 97,000 tonnes of CO2 yearly.	CIRCE (coordinator) CERTH KTH UNIGE CEI TORRECID	Jan 2024 – Dec 2027

<u>METAWAVE</u>	METAWAVE integrates advanced microwave-based heating systems to improve energy efficiency and reduce greenhouse gas emissions in industries such as ceramics, asphalt, and aluminium production.	CORE	Jan 2024 – Dec 2027
<u>SOLINDARITY</u>	Solar-driven industrial heat upgrade for industries using solar thermal panels, high-temperature heat pumps, and AI tools to enhance process efficiency. Focus on decarbonising industries with temperatures up to 280°C, with pilot projects in Germany, Greece, and Italy.	CERTH (coordinator) CIRCE UNIGE ART	Jan 2024 – Dec 2027
<u>CAPTUS</u>	Develops CCU technologies to transform CO2 emissions from cement, steel, and chemical plants into renewable energy carriers using surplus renewable energy.	CIRCE (coordinator) CERTH	Jun 2023 – May 2027
<u>FLEXIndustries</u>	Focused on enhancing energy efficiency and process flexibility in energy-intensive sectors. This project introduces a dynamic platform to optimize processes, integrate renewable energy, and develop innovative energy storage solutions for industrial environments. Demonstrations span 7 facilities across 6 countries.	CERTH CIRCE STAM K-FLEX	Jun 2022 – May 2026
<u>REEFLEX</u>	Maximising the flexibility of distributed energy resources through flexibility markets. It focuses on creating opportunities for SMEs and start-ups to enter demand-side flexibility markets, developing a central interoperability platform, and creating AI-based services and automation systems.	CIRCE (coordinator) CERTH	Jan 2023 – Dec 2026
<u>EEETHOS</u>	EEETHOS aims to decarbonize industrial process heating by developing key-enabling technologies for energy-efficient, flexible, and decarbonized heating in industrial sectors like asphalt, ceramics, pulp & paper, bricks, and steel. The technologies include high-temperature heat pumps and digital twin solutions for optimized operations.	CERTH	Nov 2024 – Oct 2028

<u>CITADEL</u>	The project focuses on replacing fossil fuel-based combustion processes in industries like brick, glass, copper wire, and steel production with advanced electric technologies to reduce CO2 emissions.	KTH	Jan 2024 – Dec 2027
<u>HyInHeat</u>	The HyInHeat project focuses on the integration of hydrogen combustion systems for high-temperature heating processes in energy-intensive industries, specifically in the aluminum and steel sectors.	n/a	Jan 2023 – Dec 2026
<u>INFERNO</u>	The project focuses on recycling industrial waste heat through the application of thermophotovoltaic (TPV) and thermoelectric technologies to generate electricity. It aims to address inefficiencies in current heat recovery technologies, providing a more cost-effective and efficient solution for converting industrial waste heat into electricity.	n/a	May 2024 – Apr 2027
<u>ALCHEMHY</u>	ALCHEMHY aims to develop electrified processes for the decentralized production of ammonia and methanol using renewable hydrogen as a feedstock. This includes innovations like Magnetic-Heated Sorption-Enhanced Reactors (MSER) and Direct Electrosynthesis of Ammonia (DESA). The goal is to decarbonize production, intensify the processes, and optimise performance using new catalysts.	CIRCE (coordinator) WR CORE	Oct 2024 – Sept 2028
<u>ModHEATech</u>	The project ModHEATech focuses on the decarbonization of the ROLLING MILL plant, based on the introduction of hybrid heating technology, based on electrification and gas-burning properly combined. Currently, the state-of-art of reheating furnaces is based on CH4 burners, with an evident environmental impact on CO2 emissions.	n/a	Mar 2023 – Mar 2026
<u>Push2Heat</u>	Push2Heat aims at addressing the technical, economic, and regulatory barriers that prevent heat upgrading technologies to be widely deployed. It will do so by scaling up four different technologies (whose supply temperatures range from 90 °C to 160 °C) to optimise their efficiency and economic performance. In addition, it will focus on integrating them into the relevant industrial sectors such as the paper and chemical industries.	n/a	Oct 2022 – Oct 2026

<u>SUSHEAT</u>	SUSHEAT introduces a rational concept to harvest energy from renewable sources, waste heat, and/or ambient heat, while developing the key components for a new generation of highly efficient industrial heat upgrade systems at the same time. This is to explore alternative industrial energy solutions to replace fossil fuels in manufacturing processes.	KTH	May 2023 – Apr 2027
<u>COMHPTES</u>	COMHPTES aims to develop innovative heat pump (HP) and thermal energy storage (TES) cost-effective compact technologies, and to demonstrate them up to TRL 5 in a fully integrated flexible and modular system able to supply heat and cold energy on demand for industrial applications, including interfaces with affordable renewable energy systems (RES), waste heat recovery and district networks.	KTH (coordinator)	Dec 2024 – Nov 2027
<u>I-UPS</u>	I-UPS aims to build and demonstrate a first-of-a-kind high-temperature heat pump, coupled with energy storage and steam generation. The project is targeting industrial heat up to 400°C. I-UPS enhances system flexibility and sustainability.	KTH (coordinator)	May 2024 – Apr 2027



Electrification of industrial processes using induction and microwaves technologies



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Partners



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