IPCEI Circular Advanced Materials – Structure proposal
January 2026

IPCEI CAM RATIONALE

The IPCEI Circular Advanced Materials (CAM) is being designed against the backdrop of the following rationale:

The gap between the demand for materials (including critical raw materials) needed to produce of advanced materials crucial for renewable energy, clean mobility, and industrial decarbonization, and their availability on the European market, can be significantly mitigated through two strategies: developing of circular advanced materials for clean technologies, as defined in the following paragraph, or developing advanced materials that are less dependent on externally sourced materials. Reintroducing advanced materials or the substances embedded into them into the economy when they reach the end of their lifetime reduces the need to import or extract scarce elements, including critical raw materials. This would ensure accessibility and affordability of materials for industrial use, while strengthening the competitiveness and strategic autonomy of European market.

The development of innovative circular and sustainable alternative solutions lessens reliance on primary extraction of scarce resources, reduces the environmental impact linked to extraction, and reduces the need for landfilling and incineration of difficult-to-recycle waste materials. It does so by maintaining their value in the economy, while generating future jobs, encouraging innovation, and boosting competitiveness. This could be achieved, among other strategies, by strengthening circular tech infrastructure (e.g. by developing data-based tech infrastructure for circular resource management, and by adopting and further developing circular technologies beyond state-of-the-art).

Circular manufacturing practices – such as remanufacturing and additive manufacturing – play a key role in minimizing resource use, reducing waste, and improving production efficiency. By applying these practices, materials are retained in the economy for longer, supporting sustainable growth and resource conservation in line with circular economy principles.

Cross-border collaboration in product and process innovation can minimize supply chain risks, shorten time to market, and reduce capital costs, while enhancing the efficiency and competitiveness of the European market.

The IPCEI will contribute to developing lead EU markets by identifying end users, determining which industrial sectors will be most affected, assessing barriers to adoption, and defining the necessary market signals. Strengthening the industrial sector requires identifying European lead markets consistent with priorities and strategies, such as the manufacturing objectives of the Net-Zero Industry Act, and policies included in the Critical Raw Materials Act and the upcoming Circular Economy Act and Advanced Materials Act.

This IPCEI has been designed to classify as a research, development and innovation (RDI)/ First Industrial Deployment (FID) IPCEI, focusing on RDI beyond the state of the art in the sector concerned. It adheres to the IPCEI criteria outlined in Articles 22, 23, and 24 of the IPCEI

Communication, which require that IPCEI RDI projects must be of a major innovative nature in the light of the state of the art and that first industrial deployment (FID) activities entail the "upscaling of pilot facilities, demonstration plants or of the first-in-kind equipment and facilities covering the steps subsequent to the pilot line including the testing phase and bringing batch production to scale, but not mass production or commercial activities". The purpose is to lead the development of new products with high RDI content or the deployment of fundamentally innovative production process. This initiative aligns with the strategic priorities of the European Union, of the Green Deal, the Critical Raw Materials Act, the Net-Zero Industry Act (NZIA), the Communication on Advanced Materials for Industrial Leadership and objectives for digital transformation. The overarching purpose of the proposed IPCEI CAM is to align these strategic objectives with the specific needs of the industry.

The IPCEI CAM places circularity[1], sustainability and innovation across the value chain at its core. Every project within this IPCEI will have to be designed to support the shift towards a circular economic model, contributing to sustainable material innovation, sustainable process creation and sustainability integrated from the planning and design to the end of life of material lifecycle. Moreover, the IPCEI CAM should strengthen the strategic European autonomy through industrial ecosystem building.

OBJECTIVES OF IPCEI CAM

Objectives of the IPCEI CAM: The primary objectives include fostering the EU's strategic autonomy and advancing towards climate goals through circular and resource-efficient advanced materials. IPCEI CAM will therefore accelerate the development, scale-up, and integration of circular advanced materials, in targeted value chains and application areas supporting Europe's climate, sustainability, and industrial ambitions. The Projects in IPCEI CAM will:

- **Enhance Circularity and Resource Efficiency**: Focus on advanced materials that are more recyclable, sustainably sourced, designed to minimise waste, and to reduce material intensity.
- **Drive Innovation Across the Value Chain**: Develop and/or upscale innovative solutions for advanced materials that enhance durability, repairability, re-manufacturability and reusability, integrating circular principles from production to end-of-life.

For the purposes of this IPCEI, "advanced materials" are defined as materials that are rationally designed to have (i) new or enhanced properties, and/or (ii) targeted or enhanced structural features with the objective to achieve specific or improved functional performance. This includes both new emerging manufactured materials (high tech materials), and materials that are manufactured from traditional materials (low tech materials).[2] To be truly circular, CAMs developed in this IPCEI should be either reusable, repairable, remanufacturable or recyclable.

[1] For the purposes of this IPCEI, circularity is defined as any of the Circular Economy Strategies present in the Annex
[2] OECD working description on advanced materials:
https://one.oecd.org/document/ENV/CBC/MONO(2022)29/en/pdf

“Circular advanced materials” are defined as materials that abide to the above definition of advanced materials and contribute to at least one of the circular economy strategies listed in the Annex.

To be eligible for the IPCEI, projects must entail a “circular advanced material” according to this definition.

Additionally, the IPCEI pursues further objectives, such as promoting the Safe and Sustainable by Design (SSbD) framework[3], to ensure safety and sustainability along the innovation cycle, reducing the use of hazardous substances, minimise the use of critical raw materials, and rare and precious materials. It also emphasises data continuity across the advanced materials value chain to improve transparency, traceability, and efficiency in the development and application of advanced materials.

Supporting (secondary) objectives therefore focus on 1) developing safe and sustainable alternatives to hazardous substances, that are less dependent on critical raw materials, and rare and precious materials 2), ensuring data continuity, and 3) enabling innovative and more resource efficient production processes across the value chain. The structured, phased approach of the proposed IPCEI ensures that these objectives are consistently prioritized and integrated into a cohesive framework, bolstering the EU’s resilience and long-term technological leadership.

Industrial competitiveness principles of IPCEI CAM

The above objectives must be aligned with industrial competitiveness:

- Circularity, as defined in the R-principles listed in Annex 1, is not only a target in itself but can be a means to enhance the performance of materials, product, and processes, or to reduce overall production or use-phase costs;
- Projects must demonstrate a credible pathway to market competitiveness (with respect to market standard, established technologies and solutions);
- Solutions must be scalable within EU industrial ecosystems, to guarantee manufacturability.

Skills, Workforce and Industrial Capabilities

The success of a European strategy on Circular and Advanced Materials does not depend solely on technological innovation, but equally on the availability of a skilled workforce and on the strengthening of Europe’s industrial capabilities across the entire value chain. IPCEI CAM is expected to have multiple spillover effects notably around the development of human capital and industrial competencies as key enabling conditions for market uptake and competitiveness. By the introduction of new technologies it is inevitable process of the creating of different types of skills which will bring us to different, more demanding elements of the human capital.
This includes the need to:

[3] https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/chemicals-and-advanced-materials/safe-and-sustainable-design_en

- develop specialized technical skills in materials science, process engineering, digital manufacturing, life-cycle assessment and industrial scale-up;
- support reskilling and upskilling of the existing industrial workforce to manage new circular production processes and advanced manufacturing technologies;
- strengthen the capacity of SMEs and mid-caps to adopt and integrate circular and advanced materials solutions within their production systems;
- foster closer cooperation between industry, universities, research centers and vocational education providers to ensure alignment between education curricula and emerging industrial needs.

Projects supported under IPCEI CAM are welcome to include concrete actions related to skills development and industrial capability building, such as training programmes, industrial PhDs, exchange schemes between academia and industry, and structured knowledge transfer activities. This will ensure that Europe not only develops innovative materials but also builds the industrial and human capacity required to manufacture, deploy and scale them competitively. There also exist Advanced Material Academy on the EU level[4].

IPCEI CAM STRUCTURE

At this stage it is proposed that the structure of the Circular Advanced Materials IPCEI follows the main phases of RDI and FID projects. Industrial research relating to material sourcing and product and process design is followed by experimental development, which may take place in simulation environments or through process development. The path to industrial application is demonstrated through first industrial deployment, showing the potential for future scalability and commercialization. Project proposals can focus on one or more workstreams, depending on value chain coverage and specialization. Accordingly, partnerships within the CAM IPCEI may be established within the same workstreams or across upstream and downstream segments of the value chain. The proposed structure could be adjusted after calls for expressions of interest of the companies to participate in this IPCEI and the match-making process.

For each Workstream, projects must clearly indicate on the type of Circular Economy (CE) strategy applied, drawing from the list of CE strategies provided in Annex I. This IPCEI is relevant for both the development of advanced materials, designed and processed according to at least one of the listed CE strategies, and the development of applications or industrial processes involving advanced materials and pursuing at least one of the listed CE strategies. The IPCEI pertains to 3 priority areas of clean technologies: renewable energy and storage systems, industrial decarbonisation, and clean mobility, including applied electronics in all three sectors.

WS#1: Sustainable Material Sourcing and Design of CAM and products/applications using CAM: This workstream focuses on industrial research in sustainable sourcing and design, applying circular economy models and strategies to reduce the EU economy's dependence on non-EU primary raw materials. It supports the development of circular advanced materials in an innovative and sustainable manner.

[4] https://eitrawmaterials.eu/education-skills/european-advanced-materials-academy

1.1. Innovative technologies, techniques and processes

This sub-workstream includes the development and enhancement of **innovative techniques and technologies** for sustainable sourcing, energy- and cost-efficient disassembly and separation, recovery and refining processes, and advanced processing technologies. Moreover, the sub-workstream concerns the development of innovative processes, technologies, and techniques utilising advanced materials to achieve circularity goals in the final application. These approaches aim to keep materials in their highest-value state for as long as feasible. This also includes technologies relevant at the advanced material and application development stage, where innovative material-based technologies and techniques are used to obtain or improve material and application performance (e.g. stronger, lighter, more resilient materials and applications, with a lower carbon footprint and fewer emissions, when compared to the market standard). This may involve the creation of new circular advanced materials, the improvement of existing materials through enhanced circularity processes, or the development of novel processes and applications utilising advanced materials and applying circular economy strategies.

Innovation may be demonstrated either through the development and deployment of novel technologies to advance the circular performance of materials or applications (e.g. by improving recyclability, durability, reusability, repairability, energy efficiency...), or through the systematic integration of circularity principles into material and application development (e.g. by integrating recycled or bio-based feedstock). Given the complexity of designing advanced materials, technologies should be capable of accounting for multiple interactions, including the combination of different elements or material structures, as well as external factors (such as ambient conditions), in order to enhance functionality, efficiency, and final product performance.

To qualify as an advanced material,[5] the material developed must be engineered specifically to allow for greater product efficiency (e.g. lightweighting) or improved process efficiency (such as enhanced performance enabling more efficient industrial applications, for example higher conductivity for more efficient power transformers). Circular advanced materials, developed under this IPCEI, should display improved sustainability across the entire lifecycle (Safe and Sustainable by Design[6]). This includes innovative technologies that enable advanced functionalities and improved material properties, such as a higher potential for reuse, repair, recycling, and remanufacturing.

Focus areas include:

- Innovative techniques for sustainable sourcing, disassembly, separation, recovery, and refining;
- Re-processing technologies that preserve advanced materials at their highest value for as long as possible;

[5] 2 Advanced materials are defined by the Organisation for Economic Cooperation and Development (OECD) as materials that are designed to have new or enhanced properties, and/or targeted or enhanced structural features, leading to specific or improved functional performance. (https://one.oecd.org/document/ENV/CBC/MONO(2022)29/en/pdf)

[6] https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/chemicals-and-advanced-materials/safe-and-sustainable-design_en

- Development or enhancement of advanced materials and application performance (e.g. lighter, stronger, more resilient materials and applications, with lower carbon footprint when compared to the market standard);
- Integration of circularity principles directly into advanced materials innovation.

1.2. Innovative design techniques for Circular Advanced Materials

The design of advanced materials, products, processes, and applications is of central importance for this IPCEI, as integrating CE strategies and principles in the design phase enables a proper implementation of the “safe and sustainable by design” principle. This may entail any of the R strategies listed in Annex I, e.g. modular design, design for repairability, recyclability, reusability or disassembly, service-based models, or product and process design enabling the use of secondary raw materials, including reverse logistics and closed-loop systems. These approaches can substantially extend material lifecycles and influence end-of-life pathways. Materials are therefore engineered with their entire lifecycle in mind, from resource extraction to end-of-life, ensuring compatibility with circular practices across sectors.

This sub-workstream addresses key design-phase challenges and the integration of innovative solutions to overcome them. As the design process accounts for a significant share of the overall effort in the development and creation of advanced materials and products, it plays a critical role in the value chain.

The design phase may entail an innovative approach to (1) defining the role of the data in enhancing the accessibility and usability of material information models, and in establishing the knowledge base required for innovation); (2) sourcing relevant data, including techniques for effective data orchestration; and (3) developing data protocols and standards for advanced material interfaces, particularly where different materials and technologies are combined.

In addition, the design phase should deliver beyond-state-of-the-art “by-design” approaches, such as advanced manufacturing-by-design, safe-and-sustainable-by-design, and circular-by-design.

Tools supporting circularity in the design phase may include a range of techniques for advancing material performance, such as computational tools and sensor technologies that enable monitoring, control, and redesign of materials. Precise material and system architecture is also a key element across all priority areas. In this context, innovative predictive modelling – covering data sources, structures, and their use in virtual design environments to predict material properties and safety – is of particular relevance for this sub-workstream.

The “safe and sustainable by design” framework[7] integrates lifecycle thinking into the design of advanced material and facilitates circularity models. It is expected that the safe and sustainable by design framework is followed by applicants to the IPCEI CAM call.

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[7] https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/chemicals-and-advanced-materials/safe-and-sustainable-design_en

Advanced materials developed with the aim of substituting Critical Raw Materials in their composition can also be included.

Focus areas include:

- Modular design, design for repairability, recyclability, reusability or disassembly, service-based models, or product and process design enabling the use of secondary raw materials, including reverse logistics and closed-loop systems;
- Integration of lifecycle thinking from sourcing to end-of-life;
- Data-driven design approaches, including data sourcing, orchestration, protocols, and standards;
- Beyond state-of-the-art "by-design" concepts (e.g. advance manufacturing-by-design, circular-by-design).

1.3. Innovative enabling technologies for CE transition, testing and validation

This sub-workstream focuses on the innovative integration of advanced digital technologies as enabling tools in the development and advancement of materials and applications. This includes, for example, the development of AI-orchestrated and autonomous platforms that integrate data from multiple relevant domains, such as X-ray based techniques, chemistry-specific methods, fast automated analysis applications, and multiscale modelling supported by machine-learning algorithms. These platforms can be aimed at improvements in simulation and/or deployment environments, where they may be used to manage the complex interfacial processes that govern the operation and performance of final products in clean-technology industries, developed using circular advanced materials. The technologies applied may address all 3 priority areas (renewable energy and storage systems, industrial decarbonisation, clean mobility, including applied electronics in those areas).

Enabling technologies under this IPCEI shall support the circular economy transition and align with circular economy strategies. By incorporating innovative approaches such as machine learning and artificial intelligence, this sub-workstream aims to enable the development of materials tailored to specific applications, maximizing efficiency and circularity across the value chain. For example, under a "reuse" circular economy strategy, foundational digital technologies such as cloud computing and virtual reality can be applied to ensure component quality and performance. Digital tools can enable the identification, tracing, monitoring, and management of materials and components, which is critical during both design and subsequent manufacturing and use phases (e.g. solutions for digital product passports – DPP).

Digital technologies can also enable innovative approaches to material testing and validation, supporting improved manufacturability. Virtual testing and piloting can be applied across the entire value chain, from materials sourcing and processing to manufacturing and assembly. The integration of physical assets with their digital counterparts through digital twins and advanced data management systems provide access to real-time and historical data for informed decision-making. In addition, technologies such as RFID and blockchain enable the tracking of components via unique identifiers and their integration into advanced information models. Incorporating product lifecycle data into these models further enhances decision-making during the design and testing phases.

Digital tools and modelling are key drivers of innovation in experimental environments, for example by enabling early prediction of manufacturing impacts and supporting the improvement of circular advanced materials to reduce defect rates in production. Automation, including intelligent autonomous robots, can support experimental data generation, parameter identification for computational models, and validation of modelling results against experimental data. Existing platforms, such as AI-based Materials Acceleration Platform (MAP), may be further enhanced with advanced digital tools, including digital twins and virtualization, to improve the sustainability of processes and materials while maintaining technological compliance with established standards and certifications. Interconnection with the digital infrastructure Materials Commons[89] will be crucial for exchange of models, tools and data, acting as centralised infrastructure across the EU. Therefore, IPCEI projects generating data and addressing digital tools and modelling are expected to collaborate with the EU Materials Commons project in a concrete and measurable manner.

Advanced visualisation and virtual design techniques can further support dematerialised product and material development, metaverse-based prototyping, advanced measurement methods, and virtual modification of products into service-oriented solutions deployable in real-world settings, advanced digital technologies for the enhancement of testing and validation processes (traceability of materials, DPPs) These approaches also contribute to reducing barriers to entry for innovative SMEs.

Focus areas include:

- AI-driven platforms and digital tools for accelerating material and product development;
- Virtual testing, simulation, validation and piloting across the value chain;
- Digital twins, RFID, blockchain, and Digital Product Passports;
- Automation and autonomous experimentation.

WS#2: Circular Manufacturing, Processing, and End-of-Life Management:

This workstream represent a subsequent stage in the RDI process, integrating circularity into manufacturing and processing, and focusing on experimental development and manufacturability of circular advanced materials for clean technologies.

Building on experimental environments and the results of testing and validation, this sub-workstream addresses the integrability, applicability, and manufacturability of new and improved materials for renewable energy generation and storage systems, clean mobility and industrial decarbonization within manufacturing and processing industrial processes. It promotes low-waste, resource-efficient production technologies that incorporate circular advanced materials and/or secondary raw materials.

The workstream also addresses challenges related to the stability of material value chains and the need to minimize supply risk: to this end, it supports the development and deployment of circular technologies that enable material reinvention, promote sustainability, and facilitate

[8] https://cordis.europa.eu/programme/id/HORIZON_HORIZON-CL4-INDUSTRY-2025-01-MATERIALS-45
[9] https://materialscommons4.eu/

the implementation of circular economy strategies within material processing, including recycling and **sustainable end-of-life management strategies**.

From this perspective, the workstream covers the following areas:

2.1. **Process preparation**:

This includes the definition and deployment of smart manufacturing reference models, using innovative approaches to interpret manufacturing requirements through advanced design and technology tools. It involves the integration of engineering tools across disciplines (e.g. systems engineering, process engineering, robotics programming) to enable adaptive manufacturing strategies. Based on outcomes from the design and testing phases, manufacturing steps and sequences may be reconfigured, including the development of alternative manufacturing concepts such as platform-based material production.

2.2. **Process implementation**:

This area focuses on:

(1) the integration of innovative materials and advanced manufacturing technologies to optimise production and improve material performance, such as additive manufacturing, hybrid additive-subtractive process chains, automated production lines, and collaborative manufacturing technologies; and
(2) material recycling, recovery, and end-of-life management. Emphasis is placed on efficient and sustainable recycling and reprocessing technologies for material recovery. This includes advancements in recycling technologies for complex materials and products, ensuring valuable resources are recovered and reintroduced into the economy at the end of their lifecycle. Priority is given to critical raw materials, such as rare earth elements and metals, to reduce waste and environmental impact.

2.3. **Supply chain resilience:**

To reduce vulnerability to supply chain disruptions, this sub-workstream supports the development of supply risk mitigation strategies, involving industrial research into recyclability and material substitution. It also emphasises the models of integration of life-cycle assessment (LCA) into stock-and-flow models and the availability of transparent data on material flows. Innovative supply chain integration approaches – such as shared data platforms and co-sourcing models – are considered key enablers of circular adoption and risk reduction.

2.4. **Innovative material infrastructures**

The large-scale deployment of clean technologies requires not only technological innovation but also the transformation and optimisation of legacy infrastructures and information flows. This includes the development of materials testbeds, pilot lines, shared characterization facilities, tailored pilot plants, materials foundries. While clean technologies are advancing rapidly, their adoption is often constrained by the hurdle of embedding them into existing information systems and infrastructure. This sub-workstream therefore addresses systemic and informational bottlenecks by supporting RDI activities for the transformation of legacy systems and data infrastructures to improve resource efficiency.

As this IPCEI is not infrastructure IPCEI, any costs related to the building and construction shall be excluded. Research infrastructure (testing facilities) could be included if they are specially designed for the research needs of the IPCEI and with concrete links to projects in the IPCEI

Focus areas include:

- Process preparation through smart reference models and integrated engineering tools;
- Implementation of advanced manufacturing technologies to optimise material performance;
- Recycling, recovery, and end-of-life management for complex materials;
- Supply chain resilience, including diversification, substitution, and transparent data platforms;
- Transformation and optimisation of legacy infrastructures to enable large-scale deployment of clean technologies.

WS#3: Circularity in Application and Use-phase Optimization:

This workstream focuses on extending the lifespan of materials and products through circular use models such as repair, reuse, and refurbishment. Integrating circularity into the use phase helps reducing the need for primary resource extraction and maximises material value and utility over time. The workstream supports service models that enable products and materials to be maintained, upgraded, or repurposed, including second life applications, thereby promoting long-term efficiency and sustainability.

It is therefore important to include in the WS3 elements like demonstration of viable circular business models, economic validation of second-life and regulatory readiness and standards compliance.

This workstream is dedicated to the design, engineering, testing, piloting and first industrial deployment of the solutions developed through the RDI process. Main activities are focused around validation in an industrial or field environment. Also in this case, priority areas shall be taken into account (renewable energy and storage systems, industrial decarbonisation, clean mobility, including applied electronics in those areas).

Focus areas include:

- Use-Phase Optimisation and Lifetime Extension – Extending the operational lifetime of materials and products through modularity, predictive maintenance, and performance monitoring under real operating conditions.
- Repair, Reuse and Refurbishment Systems – Establishing practical systems for the repair, reuse, and refurbishment of high-value components, ensuring the retention of functionality and material value across multiple use cycles.

- Repurposing and Functional Second-Life Applications – Developing and validating second-life pathways for materials and components in alternative applications with minimal reprocessing and clear economic viability.
- Validation, Piloting and First Industrial Deployment (FID) – Demonstrating solutions in industrial or field environments with proven technical performance, economic viability, and readiness for large-scale deployment.

Annex 1: Circular Economy Strategies in scope

Fundamental Circularity Measures (with examples for realisation)

Projects must apply by themselves or through collaborations at least one of the following circularity strategies (rethink, reduce, repair, re-use, remanufacture, or recycle) that aim to extend the duration of use at the highest value level possible. Next to circularity, this IPCEI also welcomes projects working towards the reduction of material intensity, the use of cleaner and low-waste processes, and the extension of material lifetime through improved stability and durability.

Rethink – Systemic Innovation for Circularity

a. **Design for circularity** – Extending product lifespan through modular design, reparability, design for disassembly, design for recycling, and service-based models from the outset. These strategies ensure prolonged product usability and easier end-of-life management, reducing resource consumption and waste generation.
b. **Safe and Sustainable by Design** – Ensuring that materials are safe for human health and the environment throughout their lifecycle
c. **Material traceability** – Use of digital tracking tools (e.g., Digital Product Passports, blockchain) to ensure transparency of material information and efficient material recovery.
d. **Refuse** – Eliminate the need for the product by discontinuing its function or replacing it with a completely different solution that fulfils the same purpose.

Reduce – Efficient Material & Resource Use

a. **Minimizing virgin material use** – Prioritisation of secondary raw materials and bio-based alternatives over newly extracted resources without compromising performance.
b. **Lightweighting strategies** – Reduction of reliance on raw materials by enhancing material efficiency while maintaining performance, e.g. improving energy efficiency in mobility or energy applications.
c. **Process efficiency improvements** – Implementation of low-energy, low-waste manufacturing techniques to reduce production footprint.
d. **Phasing out harmful or non-recyclable substances** – Replacement of hazardous additives (e.g., PFAS, heavy metals) with safe, recyclable, or biodegradable alternatives.

Repair[10]

a. **Ease of maintenance & repairability** – Products designed for easy repair, ensuring availability of spare parts and repair guides.
b. **Component replaceability** – Modular and non-destructive attachment methods to allow for simple repairs and part replacements.

Re-use[11]

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[10] "Repair" is defined as "*one or more actions carried out to return a defective product or waste to a condition where it fulfils its intended purpose*". See Article 2(20) of the Regulation (EU) 2024/1781 of the European Parliament and of the Council of 13 June 2024 establishing a framework for the setting of ecodesign requirements for sustainable products, amending Directive (EU) 2020/1828 and Regulation (EU) 2023/1542 and repealing Directive 2009/125/EC, available here: https://eur-lex.europa.eu/eli/reg/2024/1781/oj/eng

[11] "Re-use" is defined as "*any operation by which products or components that are not waste are used again for the same purpose for which they were conceived*". See Article 3(13) of the Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, available here: EUR-Lex - 02008L0098-20180705 - EN - EUR-Lex

a. **Modular design & standardization** – Ensuring that parts and components can be reused across multiple product generations and/or across industries, such as via modular design and standardisation.

b. **High-value reuse strategies** – Reusing functional products and extending the first life of materials through refurbishment and secondary use in different applications.

Remanufacture[12]/Repurpose[13]

a. **High-value component recovery –** Enabling remanufacturing of components, coatings, and composite materials with minimal loss of function.
b. **Functional material regeneration** – Transforming waste into a resource by reintroducing it into the same production cycle or repurposing it for other industries, ensuring that materials retain or increase their value rather than being discarded or downcycled.

Recycle[14]

a. **Advanced recycling technologies** – Projects that contribute to improved mechanical, chemical, or bio-recycling methods to retain high quality and reintroduce materials into material circulation.

b. **Closed-loop material systems** – Innovations that ensure materials are retained within the economy rather than landfilled or incinerated. This includes closed loop within the same sector or across sectors. These innovations include innovative reverse logistics approaches enabling the recovery of materials to be reintegrated into the supply chain without becoming waste.
c. **Material purity and compatibility** – Projects that avoid material contamination and design for high-purity recovery, i.e. minimizing the use of non-recyclable or incompatible material mixtures and designing separation processes that maximize material recovery without degradation.

Annex 2 IPCEI CAM Procedural orientations

Conditions of participation

- **Possible status in the IPCEI eco-system**

Direct participant:
By integrating together individual projects, the IPCEI builds an eco-system. The most straightforward participation to this eco-system is as a 'direct participant'. Direct participants

[12] "Remanufacturing" is defined as "*actions through which a new product is produced from objects that are waste, products or components and through which at least one change is made that substantially affects the safety, performance, purpose or type of the product*". See Article 2(16) of the Regulation (EU) 2024/1781 of the European Parliament and of the Council of 13 June 2024 establishing a framework for the setting of ecodesign requirements for sustainable products, amending Directive (EU) 2020/1828 and Regulation (EU) 2023/1542 and repealing Directive 2009/125/EC, available here: https://eur-lex.europa.eu/eli/reg/2024/1781/oj/eng
[13] "Repurposing" is defined as "*any operation that results in a battery, that is not a waste battery, or parts thereof being used for a purpose or application other than that for which the battery was originally designed*" in Article 3(31) of Regulation (EU) 2023/1542 of the European Parliament and of the Council of 12 July 2023 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC, available here: https://eur-lex.europa.eu/eli/reg/2023/1542/oj
[14] "Recycling" is defined as "*any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations*". See Article 3(17) of the Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, available here: EUR-Lex - 02008L0098-20180705 - EN - EUR-Lex

are companies that have a RDI/FID project with high financial and/or technological risks that needs significant support to materialise, and that are looking for partners at different levels of the value chain, to develop their project. The companies have applied to the call for expression of interest and have been selected by their national authorities to become an IPCEI direct participant. To receive State aid based on IPCEI rules, they have to meet a number of criteria described in section 2 below.

Associated or indirect partners:
There are other possibilities to contribute to the eco-system of an IPCEI, as associated or indirect partners.

Associated partners are companies that have a RID/FID project that underwent the pre-selection procedure on national level following a call for expressions of interest. However, the project does not take part in the pre-notification process, because the national authorities do not plan to grant aid to the project based on the IPCEI rules.

Indirect partners contribute to the objectives of the IPCEI through collaboration(s) with at least one IPCEI direct participant or one associated partner. Typically, they do not carry out any RDI/FID project of their own but supply equipment/services to direct participants.

The specific status of each applicant will be discussed with the national authorities during the design phase.

2. Requirements for direct participants in an IPCEI

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ll requirements for direct participation in an IPCEI are detailed in the **Technical guidance on conditions and process for participation in an IPCEI**.

- **Major innovation**: project must be highly innovative and must aim to considerably advance existing technologies or develop new technologies (see primary objectives).
- **Integration**: All individual projects participating in an IPCEI must be complementary to each other and together form an integrated IPCEI project. This integration is achieved through the establishment of effective cross-border collaborations among direct participants of the IPCEI (see primary objectives).
- **Positive spillover effects**: the benefits of an IPCEI must not be limited to the companies or the sectors concerned but must be of wider relevance and application to the economy or society. Spillover effects entail a mandatory commitment to disseminate know-how generated thanks to the State aid stemming from your IPCEI project to other levels of the value chain, up- or downstream markets.
- **Funding gap**: the company has to demonstrate that its project would not be carried without State support because it displays a 'funding gap'. In other words, without public funding the company will not implement the project. The company has to provide realistic and credible financial projections justified by company internal documents or independent studies.
- **Contribution to EU objectives and strategies**: Each IPCEI aims to significantly add value to the EU economy and society. The specific objectives of IPCEI CAM are described as primary and secondary objectives in the rationale of the IPCEI.

- **Other requirements**: the project must contribute to overcome important or systemic market failures, the company has to contribute to the financing of its own project, the project has to comply with the 'Do no significant harm' principle, and the aid received must not lead to undue distortion to competition and trade.

3. **Process as a direct participant in IPCEI CAM**

The lifecycle of an IPCEI consists of four phases: (i) identification, (ii) design, (iii) assessment and (iv) implementation. After the identification phase, once Member States have endorsed an IPCEI candidate in a high-level meeting of the JEF-IPCEI, the design phase starts. During the design phase, the participating Member States, led by the coordinator Member State(s), shape the IPCEI, decide on its scope and select and screen projects on national level. The phase concludes with the IPCEI pre-notification to the European Commission, thus initiating the assessment phase.

National specificities

Each Member State will have to set the deadlines to reply to the calls for expression of interest, its methodology to evaluate/score the applications received and provide the contact details.

Legal basis and guidance on IPCEI

Following Article 107(3)(b) of the Treaty on the Functioning of the European Union (TFEU), aid to promote the execution of an important project of common European interest or to remedy a serious disturbance in an economy of a Member State may be considered compatible with the internal market.

In 2021, the Commission published the currently applicable Communication on the criteria for the analysis of the compatibility with the internal market of State aid to promote the execution of IPCEIs (OJ C 528, 30.12.2021, p. 10–18).

The latest versions of these templates are available at Guidance & Templates - Competition Policy - European Commission.

The Technical guidance on conditions and process for participation in an IPCEI explains the criteria that must be fulfilled in order to join an IPCEI as a direct participant, as an associated or as an indirect partner.

The IPCEI website provides useful general information on IPCEI.

Disclaimers

Member States are simultaneously launching calls for expression of interests in the context of building a new Important Project of common European Interest on Circular Advanced Materials ('IPCEI CAM'). IPCEI CAM will materialise only if enough individual projects in at least four Member States are selected following the national calls for expression of interests.

Depending on their national specificities, each Member State may decide to organise its calls for expression of interests in one or two stages [for Member States to discuss whether they plan one or two stages – the text of the call would need to be adjusted to that]

- When the call for expression of interests is organised in two stages, the companies will be asked in the first stage to fill in the IPCEI CAM application template, which corresponds to a shorter version of the Project Portfolio.
- In a second stage, the companies having been invited to do so by the Member States will have to provide a full **Project Portfolio ('PP')** and a comprehensive **Funding Gap ('FG')** analysis, in accordance with the latest standard templates published by the European Commission. The latest versions of these templates are available at Guidance & Templates - Competition Policy - European Commission. The PP has been adjusted for the purpose of IPCEI CAM.

If the call for expression of interest is organised in one stage only, all companies applying to the call will be expected to provide the full PP and a comprehensive FG analysis, as adjusted for the purpose of IPCEI CAM.

Submission of the description of the project does not give rise to any claim for funding. It is explicitly stated that any project funding is based on a technical assessment, the available budget, the integration of the project into the specific IPCEI and the European Commission's approval under State aid law. No guarantees are therefore given as to the final amount of any State aid, including to companies invited to participate in stage 2.