

1 The LIFE CO₂toCH₄ project

LIFE CO₂toCH₄ aims at developing and demonstrating an innovative, integrated, and sustainable industrial process for simultaneous energy storage and CO₂ capture and utilization (CCU). The ultimate goal of the project is to construct, test and operate (TRL8) a smart mobile unit for hybrid energy storage able to be installed in remote energy systems that commonly have low capacity (e.g. remote areas or islands that are not connected with the central energy grid). The technology relies on Renewable Energy Sources (RES) for water electrolysis, and subsequently, the produced H₂ is biologically converted into methane (as a non-fossil biofuel) together with CO₂ from exhaust gasses.

The project is co-funded by LIFE, the financial instrument of the European Union (EU) supporting environmental, nature conservation and climate action projects throughout the EU. LIFE Programme supports innovative low-carbon technologies in all EU countries and boosts growth and competitiveness. In this context, LIFE CO₂toCH₄ is in line with EU strategies and policies for combatting climate change as follows.



2 EU Action Strategies for combating climate change

EU Action for combating climate change incorporates strategic plans with goals focusing on several sectors (climate strategies and targets, sustainable carbon cycles, effort sharing with Member States' emission targets, funding for climate action, European Climate Change Programme etc). In this context, under the European Climate Law, EU countries must cut greenhouse gas emissions by at least 55%, by 2030. Their goal is to make the EU climate neutral, by 2050.

More specifically, the European Green Deal (EGD) refers to the establishment of the core EU strategy to fight climate change and achieve climate neutrality by the European Council and the European Commission, as adopted on the 12th of December 2019. Two (2) years later, the European Commission adopted a new set of policy proposals for preparing the implementation of the EGD, namely the "Fit for 55".

In general, the EGD is an action plan fighting climate change while the Fit for 55 package focuses on specific topics for fulfilling the goal of a 55% reduction of greenhouse gas emissions by 2030 (compared to 1990 levels). It has to be noted that the Fit for 55 package is a set of legislative proposals and amendments to existing EU legislation thus helping towards lower greenhouse gas emissions (Picture 1).



Picture 1: Fit for 55 Package legislative proposals and amendments

3 Policies for climate neutrality

The EU climate goals are translated into policy focusing on climate neutrality. The policies interrelated to the LIFE CO₂toCH₄ project refer to energy, climate and environmental strategies. Following, the legislative acts interrelated to the project are provided based on their policy context.

3.1 Energy policies

In specific, the energy strategy focuses on the energy transition incorporating a socially fair and cost-efficient process moving from fossil fuels to a clean energy system. In this context, the increased use of renewable sources and their systemic integration is fostered for reducing greenhouse gas emissions.

LIFE CO₂toCH₄ project is in line with several policies under the EU energy strategy (Picture 2):

- **COM/2015/080 final, A framework strategy for a resilient energy union with a forward-looking climate change policy.**

The key priorities of this document refer to the development of a fully integrated internal energy market and the reduction of energy imports thus improving energy efficiency. In addition, it supports breakthroughs in low-carbon and clean energy technologies by prioritizing research and innovation for decarbonizing the economy.

- **2018/2001/EU, Renewable Energy Directive REDII**

The EU Directive 2018/2001 is a recast of the Fuel Quality Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (RED I). Also, it establishes an overall policy for the production and promotion of energy from renewable sources in the EU.

The RED II defines a series of sustainability and Greenhouse Gas (GHG) emission criteria that bioliquids used in transport must comply with to be counted towards the overall 14% target and to be eligible for financial support by public authorities.

Under the EU RED I, biomethane used for electricity and heat production has not been subject to the same sustainability criteria as when used for transport. There has been a consensus in the past that binding sustainability criteria would impose a high cost on these sectors, endangering their competitiveness. Within the EU RED II, biomethane falls under the category of biogas and is no longer limited to the transport sector.

The EU RED II has split biomethane into two groups, with two separate potential values: i) a renewable transport and heating/cooling fuel under the mass balance system, with GHG mitigation value for reaching the targets under Article 29 (1), and ii) a green added value to energy products, under the GO-scheme (mean to prove to the end-consumer that a specific share of the energy someone is consuming originates from renewable resources).

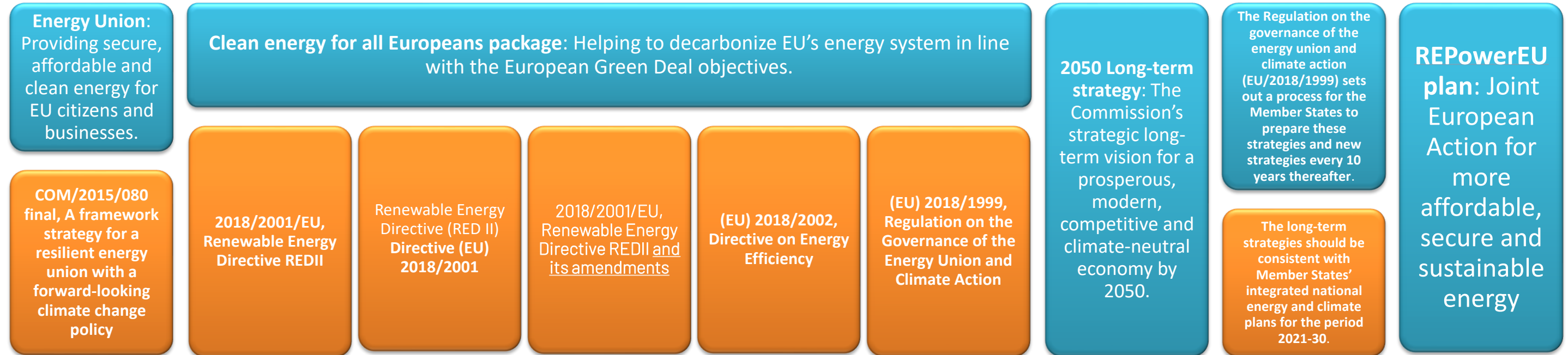
- **Renewable Energy Directive (RED II) Directive (EU) 2018/2001 and its amendments**

The amendment of REDII resulted in a series of revised documents, such as the Amendment of the Fuel Quality Directive (EU) 2015/1513, namely the iLUC Directive. The key element of the amendment is the contribution of biofuels produced from 'food' crops (to the 10 % renewables in transport target) is capped at 7%. The other 3% will come from a variety of multiple-counted alternatives.

- **(EU) 2018/2002, Directive on Energy Efficiency**
Under this Directive, the EU has set binding targets of increasing energy efficiency over current levels by at least 32.5% by 2030.
- **(EU) 2018/1999, Regulation on the Governance of the Energy Union and Climate Action**
Each EU country is required to establish integrated 10-year national energy and climate plans (NECPs) for the period 2021-2030. The NECPs outline how EU countries will achieve their respective targets on all 5 dimensions of the energy union, including a longer-term view towards 2050.
- **2050 Long-term Strategy**
The Regulation on the governance of the energy union and climate action (EU/2018/1999) sets out a process for the Member States to prepare these strategies and new strategies every 10 years thereafter. The long-term strategies should be consistent with Member States' integrated national energy and climate plans for the period 2021-2030.

Finally, the **REPowerEU** plan sets out a series of steps to rapidly reduce dependence on Russian fossil fuels paving the way to a green transition. The plan is based on increasing the resilience of the EU-wide energy system by (i) saving energy, (ii) producing clean energy, and (iii) diversifying the energy supplies of the EU. In this context, the REPowerEU plan addresses the multiple challenges of maintaining the EU's energy security while ensuring energy affordability and simultaneously maintaining its 2050 climate-neutrality targets.

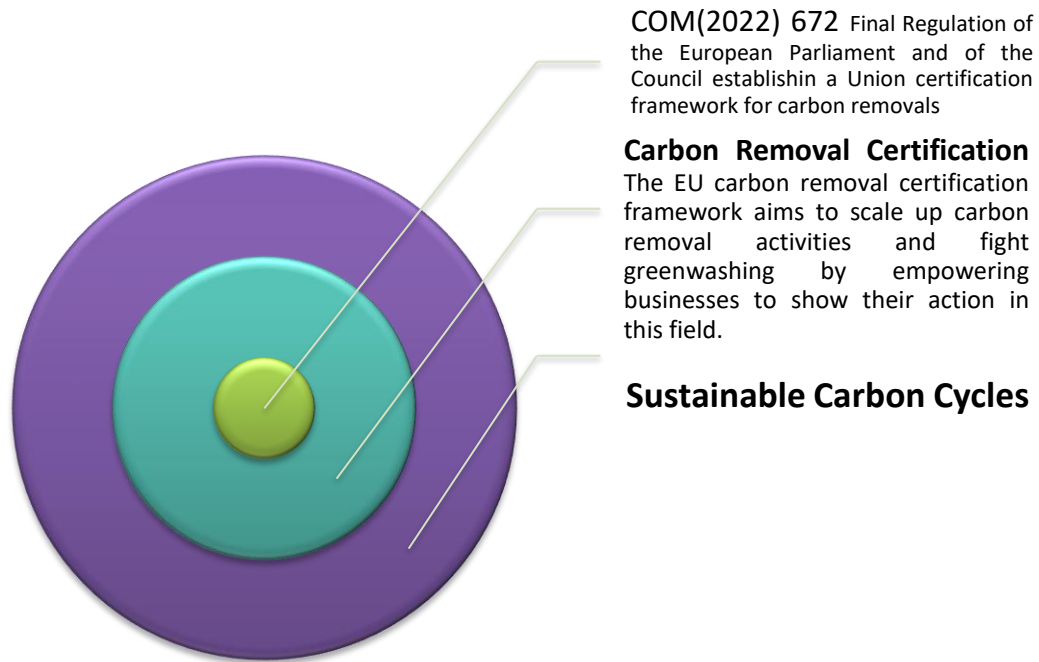
EU Energy Policies



Picture 2: Policies interrelated to the LIFE CO₂toCH₄ project with reference to the EU Energy Strategy.

3.1.1 Policy focusing on CCUS

Carbon Capture Utilisation and Storage technologies are regulated under the EU Directive 2018/2001. This Directive is focusing on the use of energy from renewable sources and from captured CO₂. In this context, key actions supporting industrial capture, use and storage of CO₂ are listed under the Communication on Sustainable Carbon Cycles (COM/2021/800). This Communication also forms the basis for the certification of carbon removals.



Picture 3: Policies interrelated to the LIFE CO₂toCH₄ project with reference to Sustainable Carbon Cycles Action

Based on the Communication, the first EU-wide voluntary framework to reliably certify high-quality carbon removals was proposed by the European Commission. The proposal, relying on deploying innovative carbon removal technologies and sustainable carbon farming solutions, provides a voluntary set of rules for certifying high-quality carbon removals (Picture 3). By combining its emission reduction efforts with increased use of carbon removals across different sectors, the EU is moving forward to enforce environment and climate policy thus achieving climate, environmental and zero-pollution goals. Moreover, this regulation shall significantly improve the EU's transparency in terms of carbon removals quantification, monitoring and verification. This way, stakeholders' trust shall be ensured thus preventing greenwashing.

The LIFE CO₂toCH₄ project provides an innovative, integrated, and sustainable industrial process for simultaneous energy storage and CO₂ capture and utilization. Considering its conversion efficiency of CO₂ and H₂ to CH₄ >90%, carbon dioxide can be removed from almost all energy-

intensive industries. Therefore, industries using such a technology and the Carbon Removal Certification can highlight and disseminate their low-carbon activities.

3.2 Climate policies

Focusing on climate strategy, the **European Climate Law** Regulation (EU) 2021/1119 enshrines into law the EU's climate-neutrality objective, ensuring that all EU actions and policies contribute to it in a socially fair and cost-efficient manner incorporating all societal and economic sectors. In this context, the LIFE CO₂toCH₄ project can achieve a reduction of CO₂ in carbon-intensive industries thus contributing to the reduction of greenhouse gas emissions target according to the law.

Moreover, the **Green Paper COM (2013) 169** is built on the experience and lessons learnt from the 2020 framework and provides improvements. Amongst the improvements proposed, the Communication discusses options to further promote the timely demonstration and early CCS deployment. In addition, the Green Paper paves the way for creating certainty for RES investors in order to reduce the administrative burden and increase clarity in planning.

Finally, the European Commission puts forward a roadmap for a competitive low-carbon Europe by 2050. The **Roadmap COM (2011) 112** presented possible action up to 2050 which could enable the EU to deliver greenhouse gas reductions in line with the 80 to 95% target agreed upon internationally. The roadmap outlined milestones towards the target, policy challenges, investment needs and opportunities in different sectors:

- ▶ This would involve cuts to the EU's greenhouse emissions by 80% by 2050 (compared with 1990 levels) entirely through measures taken within Europe. Intermediate cuts of 25% by 2020, 40% by 2030 and 60% by 2040 would be needed.
- ▶ Improving energy efficiency, for instance by investing in energy-efficient buildings and transport, can make the biggest contribution to reducing emissions.
- ▶ Clean electricity – produced almost entirely without greenhouse emissions – will also have a major role to play, partly replacing fossil fuels for heating and transport (e.g. electric cars).

EU Climate policies

2030 Climate & Energy framework (2014): 40% cuts in GHG, 32% share from RES, 32.5% improvement in energy efficiency by 2030.

2050 long-term strategy: The EU aims to be climate-neutral by 2050 – an economy with net-zero greenhouse gas emissions. This objective is at the heart of the European Green Deal and in line with the EU's commitment to global climate action under the Paris Agreement.

GREEN PAPER COM(2013) 169, A 2030 framework for climate and energy policies

COM (2011) 112, A Roadmap for moving to a competitive low carbon economy in 2050

Picture 3: Policies interrelated to the LIFE CO2toCH4 project with reference to the EU Climate Strategy.

3.3 Environmental policies

EU Action has developed environmental strategies for several environmental issues. Amongst the issues addressed, LIFE CO₂toCH₄ is interrelated to policies focusing on air quality, industrial emissions and circular economy.

3.3.1 Policy focusing on air quality

The reduction of pollution for improving air quality is the main goal of the EU Action Plan: "Towards a Zero Pollution for Air, Water and Soil" (and annexes) SWD(2021) 140 final} - {SWD(2021) 141 final}. This EU Action Plan was adopted on 12 May, 2021, and is one of the key deliverables of the European Green Deal. Under this Action plan, the Directive 2008/50/EC on ambient air quality and cleaner air for Europe defines common methods to monitor, assess and inform on ambient air quality in the EU. In this context, the reciprocal exchange of information and reporting on ambient air quality is described at the Decision 2011/850/EU.

LIFE CO₂toCH₄ is a project dedicated to improve air quality of industrial areas and/or remote areas via capturing CO₂ and producing biomethane. Valuable feedback regarding the project outcomes shall be regularly reported and communicated to the general public and associated beneficiaries.

3.3.2 Policy related to the circular economy

The new Circular Economy Action Plan of the European Commission COM(2020) 98 final was adopted in March, 2020. LIFE CO₂toCH₄ is in line with specific goals of the action plan, namely:

- ✓ pollution reduction,
- ✓ reduction of emissions for climate-neutrality,
- ✓ creation of new business opportunities and local quality jobs, and
- ✓ enabling more resilient value chains.

3.3.3 Industrial emissions policies

The new Circular Economy Action Plan (CEAP) {SWD(2021) 140 final} - {SWD(2021) 141 final} established in 2020 is one of the building blocks of the European Green Deal agenda for sustainable growth. In this context, the transition of Europe to climate neutrality shall reduce pressure on natural resources and biodiversity. To this end, the control of industrial emissions and industrial accidents plays an important role in reducing negative environmental impacts. Therefore, on the 12th of May, 2021, the European Commission adopted the Zero Pollution Action Plan.

LIFE CO₂toCH₄ project is in line with the key objectives of the Zero Pollution Action Plan focusing on:

- ✓ Reducing environmental impacts of CO₂ in industrial emissions.
- ✓ Raising awareness of the harmful impacts of CO₂ industrial emissions.
- ✓ Contributing towards a greener industry.

Finally, it has to be noted that the LIFE CO₂toCH₄ project contributes to key policies under the Zero Pollution Action Plan, namely:

