



European
Commission

Clean energy transition to REPower the EU

A SYNERGY INFO PACK
BY CORDIS

Research and
Innovation

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CO2NTROL

Editorial

Climate neutrality and energy sovereignty are two sides of the same coin.

Let's start with climate neutrality. The EU Green Deal has the goal of reducing net greenhouse gas emissions by at least 55 % by 2030 (compared to 1990 levels). In doing so, it not only looks to make Europe the world's first climate-neutral continent by 2050, but it also aims to transform the EU into a modern, resource-efficient and competitive economy – an economy defined by innovation, investment and jobs.

All of this is happening against the backdrop of Russia's invasion of Ukraine, which brought the issue of the EU's energy dependence to the forefront. With energy prices skyrocketing and facing a volatile energy market, the EU has no choice but to look for new means of securing its energy supply.

While the quick fix solution would be to increase fossil fuel imports from other countries, doing so would jeopardise the EU's Green Deal objectives. Energy sovereignty should not come at the cost of the climate; any decision relating to energy security must be aligned with meeting the goal of climate neutrality.

Unfortunately, doing so is easier said than done.

Achieving both energy sovereignty and climate neutrality will require a substantial increase in everything from energy efficiency home renovations and the decarbonisation of industry to the adoption of climate-conscious lifestyles by citizens. It will also require public-private cooperation, community engagement, new technologies, innovative infrastructure, sustainable transportation alternatives, and integrated smart grids.

That's a tall order, but one that is being delivered by the 33 EU-funded projects highlighted in this **Clean energy transition to REPower the EU Synergy Info Pack**.

All the projects featured in the Synergy Info Pack are managed by **CINEA, the European Climate, Infrastructure and Environment Executive Agency**. Established by the European Commission under the motto 'Funding a Green Future for Europe', CINEA contributes to the European Green Deal by implementing parts of EU funding programmes for transport, energy, climate action, environment, and maritime fisheries and aquaculture.

In the following pages, you'll read about how these CINEA-managed projects are working to decarbonise industry, renovate buildings, change consumer behaviour, innovate new ways to produce renewable energy, build smart grid infrastructure, and electrify the mobility sector.

Although each project comes from different sectors, countries and funding programmes, they all share a commitment to advancing Europe's clean energy transition – a transition that will reduce Europe's dependence on foreign-imported fossil fuels while increasing its use of home-grown, carbon-neutral renewables and diversifying alternative energy sources and technologies.

In other words, thanks to EU-funded projects, Europe can continue to lead the way in becoming the first climate-neutral continent by 2050.

Chapter 1

Renovating Europe's building stock

Europe's homes, offices, schools, hospitals, libraries and other buildings are the continent's single largest consumer of energy. Europe's building stock is also one of the largest emitters of carbon dioxide, responsible for 36 % of all greenhouse gas emissions. Therefore, the path to climate neutrality must start with energy-efficient buildings.

Most of Europe's buildings date to the post-war construction boom, meaning they aren't just old, they're also grossly inefficient. Their rate of renovation is also extremely slow: it's estimated that 75 % of the buildings standing in 2050 will still be energy-inefficient.

The good news is that these wasteful buildings can be made energy-efficient. The EU Renovation Wave looks to double annual energy renovation rates, with the goal of renovating 35 million buildings by 2030.

While many European citizens are willing to carry out energy renovations, they can be put off from doing so by the upfront costs. Here, the **LIFE Giga Regio Factory** project is developing a range of off-the-shelf solutions to help homeowners implement low-cost energy-efficient retrofits. For those living in areas prone to earthquakes, the **e-SAFE** project is combining energy renovation with seismic retrofitting.

Beyond bricks and mortar

Home renovations for increased energy efficiency have the potential to cut energy use, decrease emissions, reduce Europe's dependency on foreign gas, and accelerate the clean energy transition. They can also help lower household energy bills, reduce the risk of energy poverty and improve the quality of life and overall happiness of residents. The **SmartEnCity** project is using insulation and a bit of creativity to transform dated and drab apartment blocks into dynamic, energy-efficient dwellings.

Addressing the building stock's carbon footprint requires more than just making the buildings themselves more energy-efficient. The entire building life cycle – from construction to demolition – must be made efficient too. That's why the **CO2NSTRUCT** project is developing tools and models to not only evaluate the environmental impact of construction materials, but also look at their circular potential.

By helping increase the rate of energy-efficient renovations, projects such as those highlighted in this chapter are putting a substantial dent in the building stock's total energy footprint. In doing so, they're keeping Europe on track to become the world's first carbon-neutral continent.

Happiness is an energy-efficient home

Energy efficiency isn't just good for the environment: according to the SmartEnCity's project, it's good for our moods too.

That's why the project is turning dated and drab apartment blocks into dynamic, energy-efficient dwellings. The project is unique in that it takes a comprehensive approach to building renovations. Not only does it help install the insulation, doors and windows needed to reduce energy use, it also gives the building's exterior a facelift. In Estonia, buildings were even painted with decorative, energy efficiency themed murals. The net result is an increase in both energy efficiency and the quality of life and overall happiness of residents.

SmartEnCity

Project name

Towards Smart Zero CO2 Cities across Europe

Funded under

Horizon 2020-ENERGY

Coordinated by

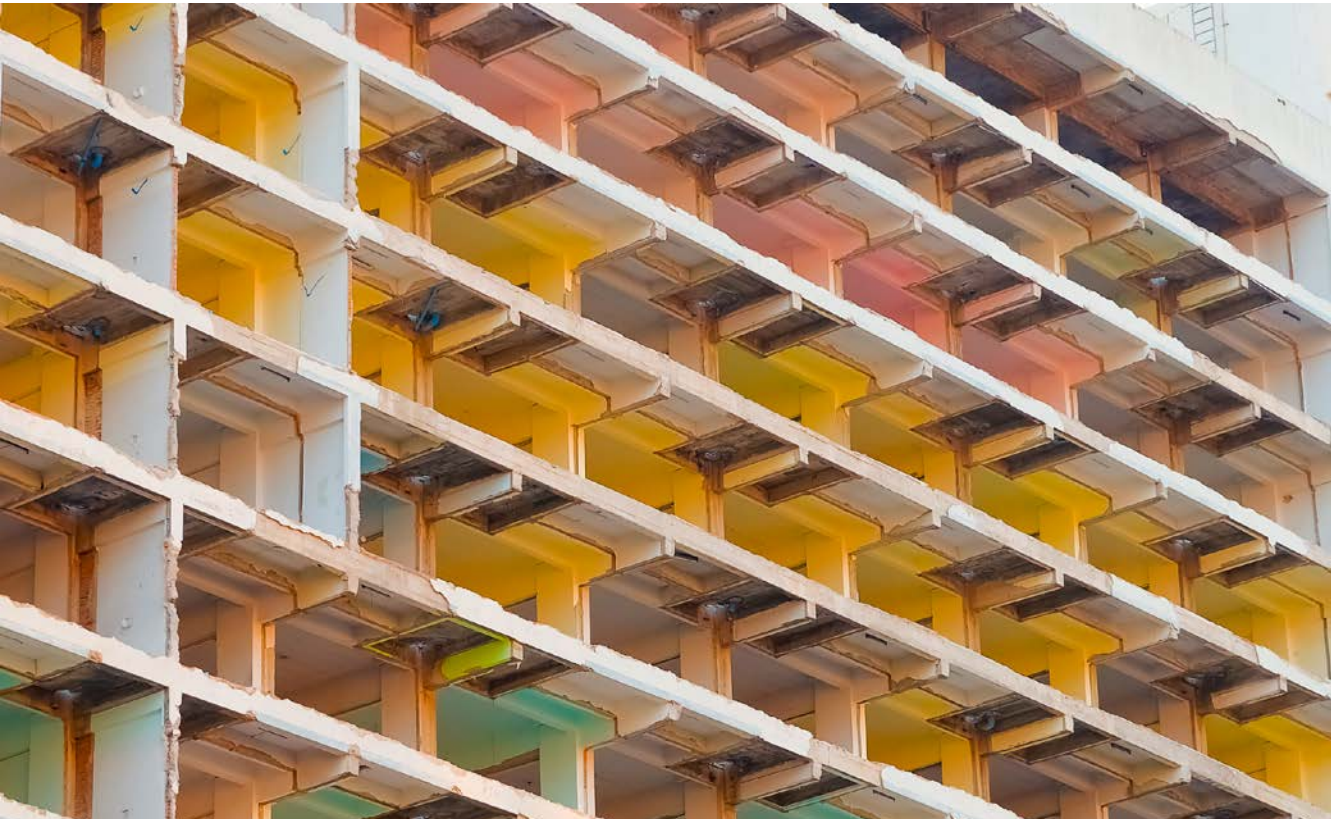
TECNALIA Research & Innovation Foundation in Spain

Duration

1 February 2016 – 31 July 2022

Find out more

smartcitynetwork.eu





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Combining renovation with seismic retrofitting

For those living in areas prone to seismic activity, energy inefficiency is just half the problem – many of these buildings aren't earthquake-resistant.

Seeing an opportunity to kill two birds with one stone, the e-SAFE project is combining energy renovation with seismic retrofitting. To do so, it has developed a portfolio of innovative, market-ready building components that combine decarbonisation goals with earthquake resilience. For example, its e-cross laminated timber solution offers both good thermal insulation and earthquake resistance. Not only does its use save energy, it could also help save lives.

e-SAFE

Project name

Energy and Seismic Affordable rEnovation solutions

Funded under

Horizon 2020-ENERGY

Coordinated by

University of Catania in Italy

Duration

1 October 2020 – 30 September 2024

Find out more

esafe-buildings.eu

Making energy-efficient renovations more affordable

While homeowners see energy renovations as a way to help lower their energy bills, many are put off by the upfront cost of the work needed.

Knowing that Europe cannot achieve its goal of renovating 35 million buildings by 2030 without the buy-in of building owners, the LIFE Giga Regio Factory project has developed a range of off-the-shelf solutions. These allow homeowners to carry out deep energy retrofits using low-cost, prefabricated elements that can simply be 'plugged' into a home's existing infrastructure. As a result, the project hopes to significantly accelerate the number of energy-efficient renovations being done.



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LIFE21-CET-BUILDRENO-LifeGigaRegioFactory

Project name

LIFE Giga Regio Factory: going next stage in market uptake and factory development for more affordable Net Zero energy renovation industrialised solutions packages

Funded under

LIFE Programme

Coordinated by

GreenFlex in France

Duration

1 November 2022 – 30 April 2025

Find out more

greenflex.com

Opportunities for circular construction

It's not just buildings that need to be energy-efficient, their entire life cycle – from construction to demolition – must be too.

The CO2NSTRUCT project is developing tools and models to not only evaluate the environmental impact of construction materials, but also look at their circular potential. With a focus on cement, steel, brick, glass, wood and insulation, the project hopes to identify opportunities for circular construction, where materials, components – and even entire building parts – are recycled or reused. The outcome will be both a decrease in carbon emissions and a transition to a more sustainable use of natural resources.

CO2NSTRUCT

Project name

Modelling the role of circular economy construction value chains for a carbon-neutral Europe

Funded under

Horizon Europe-Climate, Energy and Mobility

Coordinated by

Technical University of Denmark in Denmark

Duration

1 June 2022 – 31 May 2026

Find out more

co2nstruct.dtu.dk



Chapter 2

Shifting consumer behaviour

Conversations about the energy transition tend to focus on technology: renewable energy infrastructure, efficiency measures for buildings, electric vehicles, green hydrogen and carbon capture. This focus on technological solutions overlooks the lynchpin of the clean energy transition: us.

Whether it is renovating a home to reduce energy use, purchasing energy-efficient appliances, or switching to an electric vehicle, the change to clean energy will only work with the active participation of citizens.

Making this change doesn't need to be complex or costly. According to the **CAMPAIGNers** project, it could be as simple as eating less meat or cycling to work. To help, the project is challenging citizens to make tailored, climate-conscious changes to their daily routines.

If each of us makes just small changes to our everyday lives, the net result will be a big reduction in carbon emissions. To prove it, the **EU 1.5 Lifestyles** project is working to provide data-backed evidence on how a potential small lifestyle change could have a substantial environmental impact.

An inclusive transition

Encouraging everyone to get active in the energy transition is the idea behind energy citizenship. To promote this concept across the EU, the **GRETA** project is studying the conditions of and barriers to energy citizenship.

One of those barriers is energy poverty – an issue being addressed by the **STEP** project. The project is using information campaigns, tailored training and one-on-one advice to help those in or at risk of energy poverty benefit from the energy transition.

From energy citizens to energy communities

Citizens engaged with their energy use are a stepping stone to building energy-minded communities, initiatives that bring together citizens, local businesses, and organisations to produce and consume locally generated, renewable energy. The **LIFE_LETsGO4Climate** project estimates that these energy communities have the potential to substantially increase renewable energy production.

This impact could be even bigger, thanks to the work happening in the **ACCEPT** and **DUT** projects. The former is developing digital tools and smart devices to help these communities reduce their dependency on fossil fuels, while the latter is providing the skills and tools needed to turn global strategies into local action that promises to keep people at the centre of the clean energy transition.



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An energy transition for all

They say that the whole is greater than the sum of its parts, and the energy transition is no exception.

If each of us made an individual shift to renewable energy, the collective effect would be a significant reduction in carbon emissions. That's the concept behind energy citizenship. It's also the focus of the GRETA project. To encourage everyone to get active in the energy transition, the project is studying the conditions of and barriers to energy citizenship and exploring ways to better promote it across the EU. Their findings will help pave the way to active energy citizenship and communities.

GRETA

Project name

Green Energy Transition Actions

Funded under

Horizon 2020-ENERGY

Coordinated by

LUT University in Finland

Duration

1 May 2021 – 31 October 2023

Find out more

projectgreta.eu

Empowering communities in the energy transition

The energy transition must start with people.

That's why the ACCEPT project is working to build so-called 'energy communities', a concept that brings together citizens, local businesses, and organisations to produce and consume locally generated, renewable energy. The project is developing the digital tools and smart devices that will empower these communities to reduce their dependency on fossil fuels and their energy consumption, all while increasing household comfort. Many of these tools are being tested in volunteer households, providing project partners with data about demand response and ways to further improve the home's energy profile.



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ACCEPT

Project name

ACtive Communities & Energy Prosumers for the energy Transition

Funded under

Horizon 2020-ENERGY

Coordinated by

Hypertech in Greece

Duration

1 January 2021 – 30 June 2024

Find out more

accept-project.eu



Be the change we want to see

Meeting the 1.5 °C target established by the Paris Climate Agreement requires that everyone makes fundamental changes to the way we live.

But from what we eat to how we move and play, what exactly do we need to change? That's the question the EU 1.5 Lifestyles project aims to answer. Using an innovative 1.5-degree lifestyles approach, the project is working to connect individual changes to concrete policy goals. By being able to provide data-backed evidence on how a potential small lifestyle change could have a big environmental impact, the project hopes to encourage more people to be active participants in fighting climate change.

EU 1.5 Lifestyles

Project name

Policies and tools for mainstreaming 1.5° Lifestyles

Funded under

Horizon 2020-CLIMATE

Coordinated by

University of Münster in Germany

Duration

1 May 2021 – 30 April 2025

Find out more

onepointfivelifestyles.eu

Transforming citizens into climate campaigners

Whether it is eating less meat or cycling to work, the path to climate neutrality starts with citizens.

Helping drive this citizen-led transition to low-carbon lifestyles is the CAMPAIGNers project. With the goal of revolutionising the way lifestyle transformation research is conducted, the project is harnessing the collective power of 100 000 citizens. Using an engaging app, the project's network of 'Climate Campaigners' are challenged to make tailored, climate-conscious changes to their daily routines. Users can share experiences, draw inspiration and invite friends to join challenges. The results will help design feasible, citizen-driven initiatives for reducing greenhouse gas emissions.

CAMPAIGNers

Project name

Citizens Acting on Mitigation Pathways through Active Implementation of a Goal-setting Network

Funded under

Horizon 2020-CLIMATE

Coordinated by

Institute of Energy at Johannes Kepler University Linz in Austria

Duration

1 May 2021 – 30 April 2024

Find out more

project.climate-campaigners.com



Driving the transition to sustainable cities

Policy without action amounts to nothing more than empty promises – which is why the DUT project is all about action.

Through research, innovation, and capacity building, the project is working to help local authorities and municipalities, service and infrastructure providers, and citizens turn global strategies into local action. Specifically, DUT is developing the skills and tools needed to make the change envisioned in such policies as the Climate-Neutral and Smart Cities Mission, Green Deal, and Urban Agenda a reality. With its unique focus on co-creation and collaboration, DUT also aims to create inclusive, safe, resilient, climate-neutral and sustainable cities across Europe.

DUT

Project name

European Partnership Driving Urban Transitions

Funded under

Horizon Europe-Climate, Energy and Mobility

Coordinated by

Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology in Austria

Duration

1 January 2022 – 31 December 2028

Find out more

dutpartnership.eu





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Making the energy transition a local affair

Think globally, act locally. That's the mantra behind the LIFE_LETsGO4Climate project.

Realising that the energy transition must happen at the local level, the project has created energy communities in 18 territories across France's Centre-Val de Loire. These energy communities work with local citizens to raise awareness about the energy transition and help them take charge of their energy issues through renewable energy production projects. With 1 800 citizens already involved in locally driven energy actions, the project is confident it will succeed in increasing energy production in the territories involved by at least 14 % while simultaneously decreasing collective and individual energy consumption.

LIFE_LetsGO4Climate

Project name

Local Energy Transition Strategies Going for Climate Change

Funded under

LIFE Programme

Coordinated by

Centre-Val de Loire Regional Council in France

Duration

1 July 2021 – 30 September 2025

Find out more

life-letsgo4climate.eu

Stepping out of energy poverty

Energy poverty (when a household suffers from inadequate energy services) impacts an estimated 35 million European citizens.

Addressing this problem is STEP, a project that uses energy efficiency to help those in or at risk of energy poverty save energy and improve their standard of living. Through information campaigns, tailored training and one-on-one advice, the project encourages consumers to make lifestyle changes that could save energy – and money. It's also helping make homes more energy-efficient through such low-cost measures as insulating attics and installing low-flow shower heads. The project estimates that these efforts have resulted in a primary energy saving of 38.4 gigawatt-hours.



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STEP

Project name

Solutions to Tackle Energy Poverty

Funded under

Horizon 2020-ENERGY

Coordinated by

The European Consumer Organisation in Belgium

Duration

1 June 2019 – 31 May 2022

Find out more

stepenergy.eu

Chapter 3

Developing next-generation green energy

Russia's war in Ukraine has sent energy prices skyrocketing. As a result, the EU must look for new options to secure its energy supply. However, achieving energy independence should not come at the expense of our ambitious climate goals.

With renewable energy, it doesn't have to. Having a limited domestic supply of natural gas, Europe has long been at the mercy of imports. Prior to the war, imports from Russia accounted for an estimated 45 % of the EU's total gas demand. Add to this the fact that fossil fuel-based energy accounts for over 75 % of the EU's greenhouse gas emissions, and one can quickly see the allure of renewables.

But the reality is that renewables account for just over 22 % of the EU's current energy consumption – a long way from the REPowerEU initiative's renewable energy target of 45 % by 2030.

Closing this gap will require innovative ideas and outside-the-box thinking, which is exactly what the projects highlighted in this chapter are doing.

Increasing the power of renewables

Take for example the **BioSFerA** project, whose sustainable biofuels could reduce aviation and maritime carbon emissions by as much as 40 %. Meanwhile, the **BIPVBOOST** and **LIFE BIPV** projects look to transform city skylines into renewable powerlines by integrating photovoltaics directly into a building's roof, facade, windows and walls. Doing so could go a long way towards increasing the share of renewables in the electric grid.

Speaking of photovoltaics, in Italy, the **TANGO** project is building Europe's biggest solar factory, which will soon produce next-generation solar panels offering a 15-fold increase in production capacity over standard panels – producing enough renewable energy to meet the annual energy needs of over 2 million households.

From source to switch

While projects such as **ELWIND** and **NZOWF** are building state-of-the-art offshore wind farms in the North and Baltic Seas, the **FreShER** and **SATHScale** projects are leveraging such emerging technologies as floating solar photovoltaic installations and wind turbines.

Not to forget about those hard-to-abate emissions, the **CICERONE** project is building a cross-border value chain that will turn southern Europe's sun into the green ammonia used by northern Europe's industrial plants.

Although the innovations, technology and focus of these projects may differ, they all share the same goal of getting renewable energy up to the level needed to be both energy-independent and climate-neutral.

Set course for sustainable transport fuels

Aviation and marine transport have a direct effect on global greenhouse gas emissions and air quality.

To help mitigate this impact, the BioSFerA project looks to develop innovative, high-performing biofuels. The project is validating a combined thermochemical-biochemical pathway for developing the cost-effective technology needed to produce sustainable aviation and maritime fuels. If successful, this technology will open the door to efficiently producing next-generation drop-in biofuels that are completely derived from second-generation biomass and that could reduce the two sectors' carbon emissions by at least 40 %.

BioSFerA

Project name

BIOfuels production from Syngas FERmentation for Aviation and maritime use

Funded under

Horizon 2020-ENERGY

Coordinated by

National Center for Research and Technological Development in Greece

Duration

1 April 2020 – 31 March 2024

Find out more

biosfera-project.eu



A fresh take on solar energy

The FreShER project has developed an innovative, cost-effective mooring solution for floating photovoltaic installations.

Proven to be more efficient than their ground-based counterparts, floating photovoltaic (FPV) installations have the potential to help countries significantly scale up their production of renewable solar energy. Helping tap this potential is the FreShER project, with a mooring solution that is 63 % more cost-efficient than what's currently on the market. Installed at a fully functional FPV park, researchers are now studying the impact that weather, loads and moorings have on floating solar parks – information that could make FPVs even more efficient and expand their role in Europe's transition to renewable energy.

FreShER

Project name

Floating Solar Energy mooRing: Innovative mooring solutions for floating solar energy

Funded under

EMFF-Blue Economy Window

Coordinated by

Seaflex in Portugal

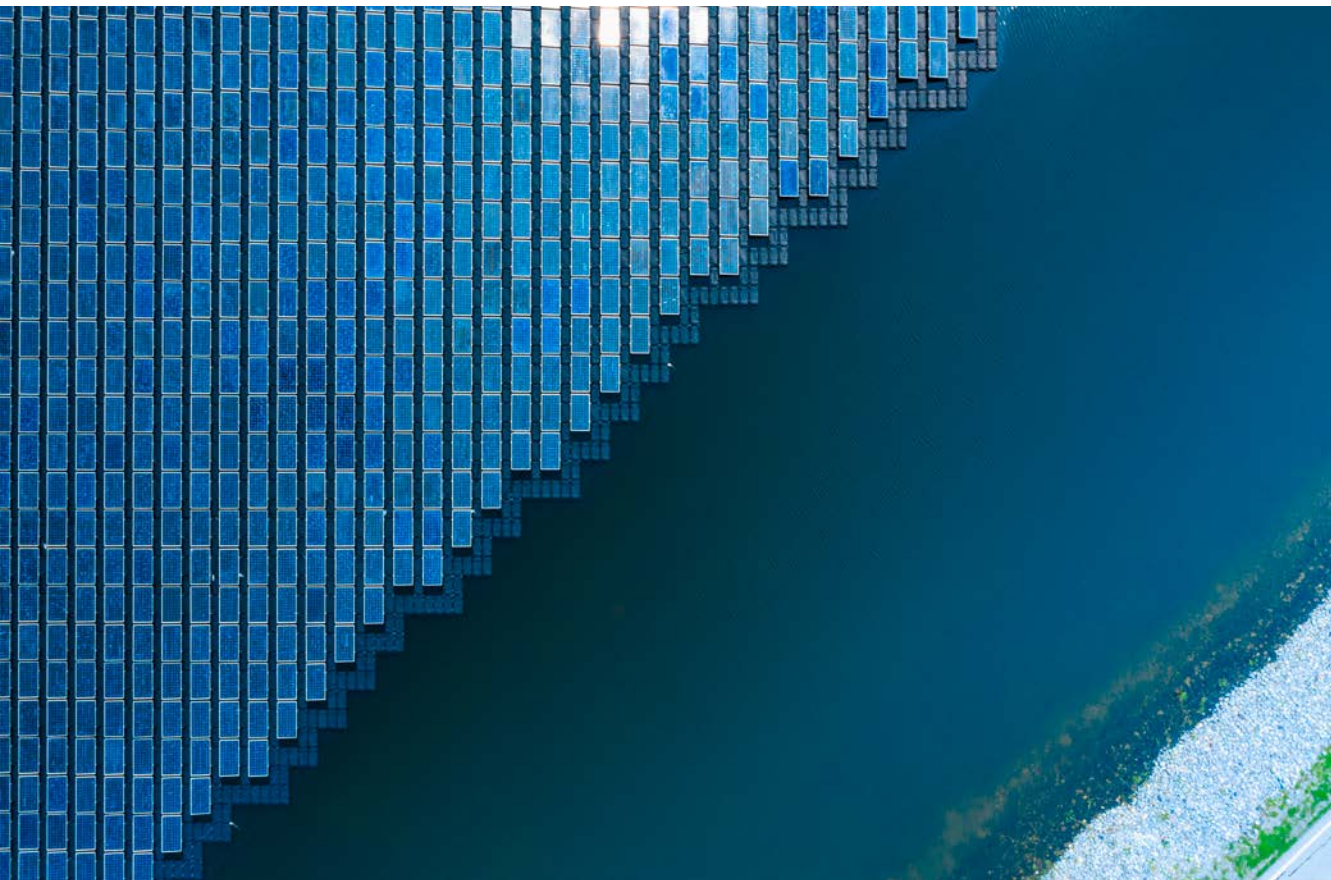
Duration

1 November 2019 – 30 September 2022

Find out more

fresher-project.eu

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Offshore wind in the Baltic Sea

The answer to energy sovereignty and climate neutrality is blowing in the wind.

The cross-border ELWIND project is working to strengthen Estonia and Latvia's energy market by investing in offshore wind electricity production and hybrid interconnection. By making large-scale domestic green energy available, the project will lower and stabilise electricity prices and help ensure the countries' energy security. The project will also accelerate the region's green energy transition: it is estimated that the electricity generated in ELWIND wind parks would cover the need to fully electrify the entire transport sector of both countries.

ELWIND

Project name

Estonian-Latvian Joint Hybrid Offshore Wind Project

Funded under

CEF Energy

Coordinated by

Investment and Development Agency in Latvia
Environmental Investment Centre in Estonia

Duration

1 March 2023 – 31 December 2027

Find out more

elwindoffshore.eu

Turning wind into green hydrogen

The N2OWF project is building a first-of-its-kind offshore wind farm in the German North Sea for producing, storing and shipping green hydrogen.

Using next-generation wind turbine generators, which feature a rotor diameter of more than 220 metres, the wind farm will achieve a 450-megawatt capacity using 40 % fewer turbines than traditional wind farms. The wind farm is expected to cover the electricity needs of nearly 400 000 households per year. Fewer turbines mean less infrastructure and maintenance, while the vessels used to ship energy will run largely on the green hydrogen produced at the site – both of which further reduce the farm's carbon footprint.



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N2OWF

Project name

Nordsee Two Offshore Windfarm
Innovation Project

Funded under

Innovation Fund

Coordinated by

Nordsee Two in Germany

Start date

1 April 2022

Find out more

bit.ly/N2OWF

Concrete benefits for the environment

The building sector accounts for up to 40 % of Europe's total energy consumption, and within this number is a big opportunity for energy savings.

To tap this potential, the BIPVBOOST project is looking at ways to integrate photovoltaics into such building components as roofs and facades. The project is particularly focused on increasing the market uptake of these sustainable solutions by decreasing their overall costs. Using short- and medium-term cost reduction roadmaps that address the entire value chain, the project aims to achieve a 75 % cost reduction – enough to trigger the market uptake needed to transform city skylines into renewable powerlines.

BIPVBOOST

Project name

Bringing down costs of BIPV multifunctional solutions and processes along the value chain, enabling widespread nZEBs implementation

Funded under

Horizon 2020-ENERGY

Coordinated by

TECNALIA Research & Innovation Foundation in Spain

Duration

1 October 2018 – 31 May 2023

Find out more

bipvboost.eu





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Building Europe's biggest solar factory

There is big, and then there is gigascale.

With the support of the TANGO project, Italy's 3Sun photovoltaic centre is set to become a gigawatt-scale factory for producing next-generation solar panels. These innovative panels feature a crystalline silicon cell sandwiched between two layers of 'thin film' silicon and are unique in that they can capture sunlight from both their front and their back surfaces. The result is more clean energy using less material and less space, at a lower cost.

Offering a 15-fold increase in production capacity over standard panels, every year the factory will produce enough panels to supply 5 445 gigawatt-hours, enough renewable electricity to cover the annual energy needs of more than 2 million Italian households.

TANGO

Project name

ITaliAN PV Giga factOry

Funded under

Innovation Fund

Coordinated by

Enel Green Power Italia in Italy

Start date

1 January 2021

Find out morebit.ly/TANGO

Floating offshore wind on the market

Europe must leverage such emerging technologies as floating offshore wind turbines if it is to meet its goal of increasing wind capacity fivefold to 60 gigawatts by 2030.

To help, the SATHScale project has developed the innovative Swinging Around Twin Hull (SATH) floating foundation technology. Unlike current floating technology, the SATH solution uses concrete instead of steel, making it suitable for use in both shallow and deep waters. It also means lower material costs, less maintenance and more durability. Having been fully tested in a 2-megawatt floating offshore wind turbine installed off the coast of Spain, the SATHScale project is focused on advancing the technology towards full commercialisation.

SATHScale

Project name

Engineering and Upscaling of New Floating Renewable Wind Energy Platform

Funded under

EMFF-Blue Economy Window

Coordinated by

Saitec Offshore Technologies in Spain

Duration

1 November 2020 – 31 October 2023

Find out more

sathscale.eu



Converting sunlight into industrial green ammonia

Ammonia is a key ingredient in many industrial processes, but making it the conventional way requires fossil fuels and results in greenhouse gas emissions.

Difficult to decarbonise, heavy industry including steel, cement and petrochemicals poses a challenge to carbon neutrality. To address this, the CICERONE global project aims to build a cross-border green hydrogen and ammonia value chain, linking the abundant renewable resources of southern European countries with industrial plants in Germany and the Netherlands. Its feasibility study is examining the potential for a 120-megawatt solar plant in Spain that will convert energy from sunlight into ammonia ready for industrial use.



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CICERONE

Project name

Ceo alliance Cross-border European
green hydROgeN valuE chain – Green
Ammonia infrastructure study –
CICERONEGreenNH3stud

Funded under

CEF Energy

Coordinated by

Iberdrola Customers
Iberdrola Renewable Energy

Duration

1 March 2023 – 31 August 2024

Find out more

europa.eu/!hftTGr



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Building renewables into our cities

The LIFE BIPV project is working to increase the use of solar cells fused into the building envelope, facade, roof or windows.

Such building integrated photovoltaics (BIPVs) can play an important role in increasing the share of renewables in the electric grid. To advance their use, the project is demonstrating innovative BIPV installations in buildings located in Germany and Spain – two regions with very different climates. While the installations themselves focus on BIPVs installed in the facade and on the roof, the project is also showcasing how this technology could be integrated into other building components, such as awnings, balconies and carports.

LIFE BIPV

Project name

Demonstration of an innovative Building Integrated PhotoVoltaic system toward net-zero-energy buildings

Funded under

LIFE Programme

Coordinated by

COMSA Corporation in Spain

Duration

1 July 2017 – 31 December 2023

Find out more

lifebipv.eu

Chapter 4

Greening the transport sector

Thanks to new technologies and forward-looking policies, the EU is making significant progress in the shift to smart and sustainable transportation. But this success should not invite complacency. There are many challenges that must still be addressed, and the projects highlighted in this chapter are working to do exactly that.

Thanks in large part to the EU's CO₂ emissions standards for new passenger vehicles, along with financial incentives offered by national governments, Europe has seen a rapid uptake in electric vehicles (EV). In 2022 alone, electric car sales in Europe increased by over 15 %, meaning that more than one in every five cars sold was electric. The EU estimates there will be at least 30 million zero-emission cars on the road by 2030.

Because of progress such as this, the European Commission, through its Sustainable and Smart Mobility strategy, is optimistic that the transport sector will be able to achieve a 90 % across-the-board cut in emissions by 2050. Yet there is more to be done to make mobility sustainable.

Sailing towards sustainability

Take the maritime sector, which is responsible for around 4 % of all CO₂ emissions in the EU. With transport by inland waterways and sea shipping expected to grow by 25 % by 2030, this footprint will continue to grow without new technologies and regulations.

Working to achieve this are the **TrAM** and **FASTWATER** projects, which are designing low-cost, zero-emission vessels powered by electricity and methanol gas. The savings continue when these ships are docked: the **INES** and **PowerFLEX** projects are developing new solutions to help electrify ports. Together, all four projects will reduce not only emissions, but air and noise pollution too.

While EV sales may have skyrocketed, the electrification of road transportation demands connected infrastructure. To help fill this gap between EV and E-roads, the **21-EU-TC-Connect-E Cohesion** project is rolling out a network of charging points across some of Europe's main travel corridors.

Heavy-duty vehicles aren't as readily electrified as their passenger counterparts. For this reason, the **LIFE NEW HYTS** project believes that green hydrogen could be a viable alternative. The project aims to create the supply and demand conditions needed for the rapid uptake of green hydrogen fuelled heavy-duty vehicles – further paving the way towards a smarter, more sustainable transport sector.

Together, these projects are helping ensure that all roads in Europe lead to climate neutrality.

Fully electric and emission-free

The TrAM project is writing the blueprint for low-cost, zero-emission inshore vessels, combining advanced modular production principles with ship design and construction.

The project has provided the industry with a toolkit for building sustainable ships. On top of bringing emissions to zero, these methods can cut production costs by a quarter and engineering costs by as much as 70 %.

The project built its own fully electric, emission-free fast passenger ferry, which is currently serving a multi-stop commuter route in Norway, and later adapted this design for the River Thames in London and the canals of Belgium, opening the floodgates for environmentally friendly ships across Europe.



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TrAM

Project name

Transport: Advanced and Modular

Funded under

Horizon 2020-TRANSPORT

Coordinated by

Rogaland County Municipality in Norway

Duration

1 September 2018 – 28 February 2023

Find out more

tramproject.eu



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Sustainable shipping with methanol

A clean fuel that is readily available in most ports and that can easily be stored aboard ships, methanol is ideally positioned to help make waterborne transport more sustainable.

Thanks to the retrofit solutions developed by the FASTWATER project, vessels can now install methanol engines to significantly reduce their CO₂ emissions. The project has already helped retrofit a harbour tugboat, pilot boat and coast guard vessel, and has plans to design a methanol-powered river cruise ship. Following careful analysis of these ships' performance, researchers plan to further develop its methanol solutions with a look towards commercialisation.

FASTWATER

Project name

FAST Track to Clean and Carbon-Neutral WATERborne Transport through Gradual Introduction of Methanol Fuel: Developing and Demonstrating an Evolutionary Pathway for Methanol Technology and Take-up

Funded under

Horizon 2020-TRANSPORT

Coordinated by

Lund University in Sweden

Duration

1 June 2020 – 31 May 2024

Find out more

fastwater.eu

Bridging the gap between EVs and E-roads

The electrification of road transportation requires more than just electric vehicles – it also requires connected infrastructure.

To help fill this gap between electric vehicles (EVs) and E-roads, the 21-EU-TC-Connect-E Cohesion project is rolling out a network of charging points for both light- and heavy-duty EVs. A total of 1 448 charging stations in 305 locations will be installed across 11 EU Member States. Once connected, this network will enable EVs to travel longer distances and across borders, resulting in a significant reduction in transport-related emissions. While the charging points will initially be installed along the Trans-European Transport Network (TEN-T) corridors, the ultimate goal is to establish a pan-European network of connected roads.



21-EU-TC-Connect-E Cohesion

Project name

Connecting National Networks and Enabling Cross-border Traffic – Electric in SE, DE and IT

Funded under

CEF Transport

Coordinated by

E.ON Drive Infrastructure in Germany

Duration

19 January 2022 – 18 January 2025

Find out more

bit.ly/CONNECT-E1

Project name

Connecting National Networks and Enabling Cross-border Traffic – Electric in RO, PL, HU, CZ, SK, SI, HR

Funded under

CEF Transport

Coordinated by

MOL Hungarian Oil and Gas in Hungary

Duration

19 January 2022 – 18 January 2025

Find out more

bit.ly/CONNECT-E2

Project name

Connecting National Networks and Enabling Cross-border Traffic – Electric in DK

Funded under

CEF Transport

Coordinated by

E.ON Drive Infrastructure in Germany

Duration

9 June 2022 – 8 June 2025

Find out more

bit.ly/CONNECT-E3

Towards a cleaner and quieter seaport

With the support of the INES project, the Port of Genoa is taking steps to reduce noise and polluting emissions such as carbon dioxide and nitrogen oxides.

At the heart of the project is an electrification of the container terminal's docks. Being able to 'plug in' while moored, the vessels no longer need to get their power from polluting on-board generators. With the generators turned off, the amount of noise emanating from the ships has decreased substantially. The net result is not only a much-needed reduction in air pollution, but also an increase in the quality of life for the citizens of Genoa.

INES

Project name

Implementing New Environmental Solutions in the Port of Genoa

Funded under

CEF Transport

Coordinated by

Port System Authority of the Western Ligurian Sea in Italy

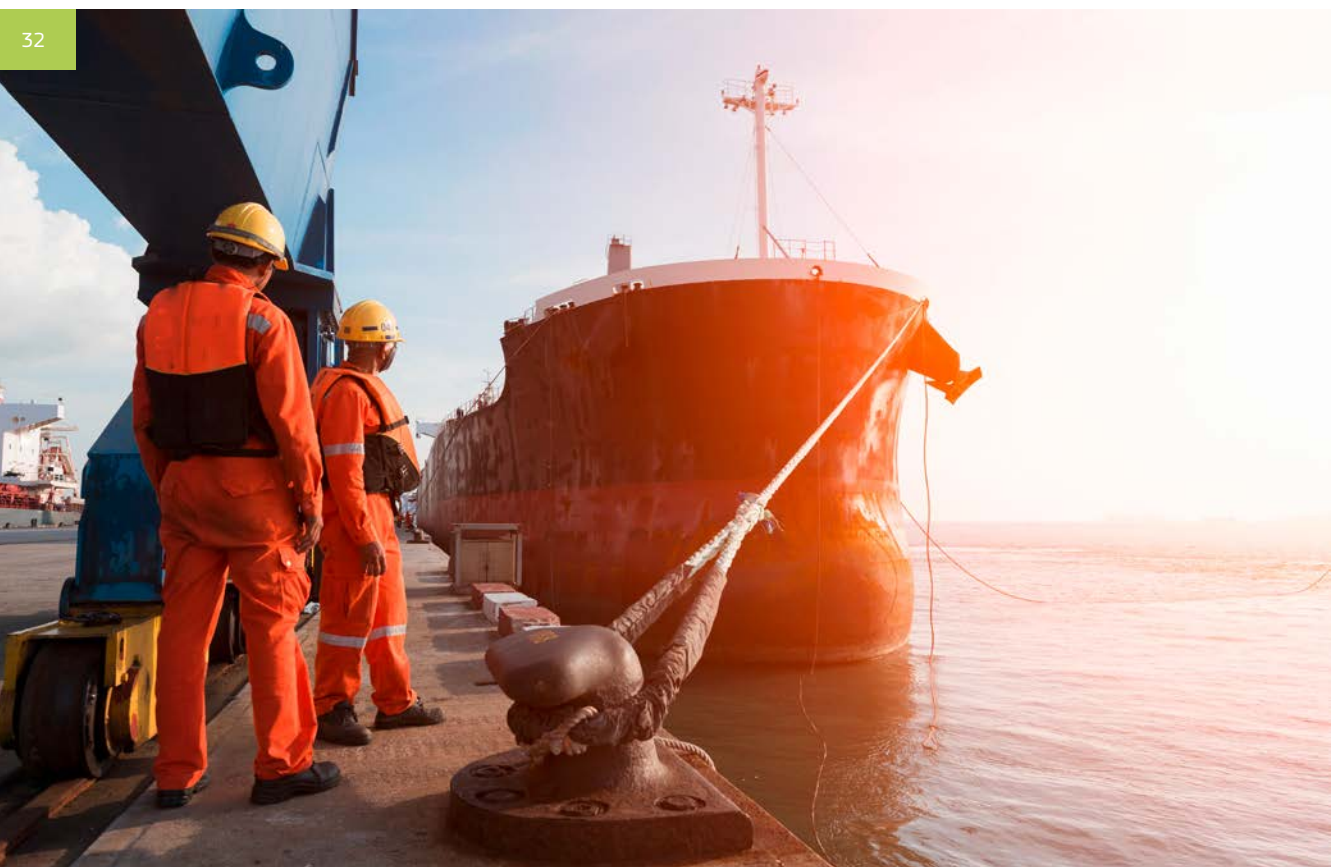
Duration

July 2015 – December 2021

Find out more

portsofgenoa.com





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Cleaner maritime shipping onboard

Container ships depend on highly polluting marine fuels, not only when travelling but also while moored at port.

Onshore power supply solutions, such as those being developed by the PowerFLEX project, could change this. By delivering shoreside electrical power to a ship when its auxiliary engines are switched off, these power supplies are already reducing carbon emissions, air pollution and noise. The PowerFLEX solution aims to take this one step further. The project is designing a market-ready system capable of powering a ship's auxiliary systems and charging its on-board batteries, offering significant reductions in CO₂ emissions.

PowerFLEX

Project name

Low-cost and flexible onshore power supply for containerships consumers' and onboard batteries charging

Funded under

EMFF-Blue Economy Window

Coordinated by

PowerCon in Denmark

Duration

1 September 2020 – 31 August 2023

Find out more

bit.ly/PowerFLEX

Paving the way to a green hydrogen future

While green hydrogen has the potential to help decarbonise road transportation, it's currently at an impasse.

Because there are so few hydrogen filling stations, there aren't many hydrogen-powered vehicles in use. But until there are more hydrogen-powered cars on the road, there's little incentive to open new hydrogen filling stations. Resolving this catch-22 is the LIFE NEW HYTS project, demonstrating the feasibility of producing, distributing and using green hydrogen locally in Utrecht, the Netherlands. It aims to model the supply and demand conditions needed for the rapid uptake of green hydrogen fuelled heavy-duty vehicles.

LIFE NEW HYTS

Project name

reNEWable green Hydrogen for Transport

Funded under

LIFE Programme

Coordinated by

KWR Water in the Netherlands

Duration

1 July 2021 – 31 December 2025

Find out more

lifewhyts.eu

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Chapter 5

Expanding smart electricity grids

While renewables are at the heart of Europe's energy transition, there is no magic switch that can be flipped to migrate from an energy system based on fossil fuels to one based on renewables. New energy systems demand new infrastructure.

This includes not only the solar panels, wind turbines and hydro generators used to generate the renewable energy, but also the smart grids for transferring it from source to socket.

The European Commission's Action Plan on the digitisation of the energy sector lays the foundation for creating an integrated energy system, one that can support the growing interconnectedness of the market and enable digital and energy value chains to work more closely together.

New technologies and integrated infrastructure

Building on this foundation are projects such as **ACON**, which is working to integrate electricity markets in Czechia and Slovakia. To do so, the project is developing a smart grid system based on such emerging technologies as intelligent load management and remote controls. This technology, used in combination with integrated infrastructure, will allow the two countries to begin introducing renewables into their energy mix.

Similarly, the **Danube InGrid** project is building an integrated, modern energy infrastructure in Slovakia and Hungary. As it works to modernise the existing grid, the project is adding such smart elements as on-load tap charges, smart metres and new fibre optics. Not only will these updates allow the grid to use large amounts of renewable energy, but they will also enable more efficient network management and control.

Bridging the gap between supply and demand

To function properly, electric grids must maintain a close balance between supply and demand. Doing so with renewables can be challenging due to natural fluctuations in sunshine and wind. Smart grids must include an energy storage component to accommodate these fluctuations, something that existing grids simply don't have.

Projects such as **EVVE** are using vehicle-to-grid technology to turn an idle electric vehicle into a virtual power plant. With plans to install nearly 800 bidirectional charging stations across Europe, the project expects to be able to feed 8.36 megawatts of energy into the grid during periods of peak consumption, helping ensure that gaps between supply and demand are filled with renewable energy and not energy produced using fossil fuels.

Through integration, innovation and technological prowess, each of these projects is helping to put the 'smart' into the grids of the future.



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Stitching Europe's grids together

To ensure a sustainable and secure energy supply to Czechia and Slovakia, the ACON project is working to integrate the two countries' electricity markets.

With a focus on developing a smart grid system, the project is using smart technologies such as intelligent load management and remote controls, along with a new communication infrastructure and an integrated information technology solution. The end result will be a better quality of electricity supply and network connectivity for all users, the potential for adding renewable energy into the system, and a long-term reduction in the power grid's environmental impact.

ACON

Project name

ACON Smart Grids

Funded under

CEF Energy

Coordinated by

Western Slovak Distribution in Slovakia
EG.D in Czechia

Duration

October 2018 – December 2024

Find out more

acon-smartgrids.cz

Modernising Europe's power network

Through the adoption of smart grid technologies, the Danube InGrid project aims to create an integrated, modern energy infrastructure for Slovakia and Hungary.

Work includes the construction and modernisation of such grid elements as substation and transformer stations and lines, while the installation of intelligent elements such as on-load tap changers and smart metres linked to new fibre optics will enable more efficient network management and control. Furthermore, the use of IT solutions will allow beneficiaries to better manage larger volumes of data, which will have a positive impact on asset management and network operations. Together, these upgrades will allow the grid to use large amounts of electricity from renewable and/or distributed energy sources.

Danube InGrid

Project name

Danube InGrid

Funded under

CEF Energy

Coordinated by

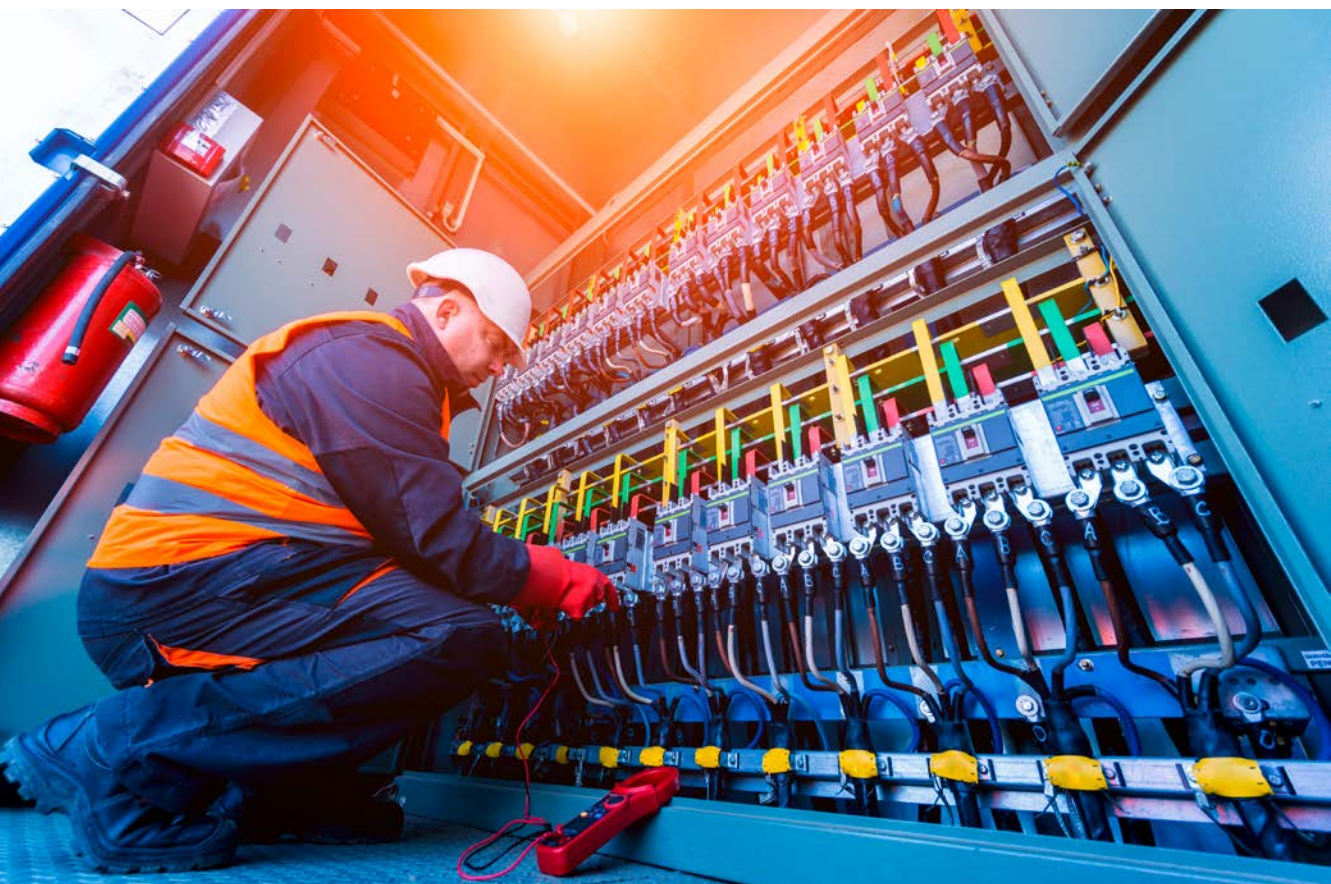
Western Slovak Distribution in Slovakia
E.ON North Transdanubian Power Network in Hungary
Slovak Electricity Transmission System in Slovakia

Duration

June 2020 – December 2025

Find out more

danubeingrid.eu



A virtual power plant – on wheels

With vehicle-to-grid technology, a parked electric vehicle becomes a miniature power plant, storing and feeding energy back into the network while it charges.

The EVVE project is installing nearly 800 bidirectional charging stations across Europe. Drawing energy from hundreds of compatible electric vehicles, this virtual battery will have an expected capacity of 8.36 megawatts. This energy can be fed into the grid during periods of peak consumption, helping ensure that gaps between production and demand are filled with renewable energy and not energy produced using fossil fuels. The project estimates that its virtual battery will result in a 25 000 tCO₂eq. (tonnes of carbon dioxide equivalent) net reduction in absolute greenhouse gas emissions during its first 10 years of operation.



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EVVE

Project name

First European Large-Scale Vehicle-To-Grid Demonstrator for an efficient decarbonisation of the energy sector

Funded under

Innovation Fund

Coordinated by

EDF in France

Start date

1 April 2021

Find out more

bit.ly/EVVE

Chapter 6

Accelerating industry's decarbonisation

Building a climate-neutral economy requires that transformative change happens in every economic sector, including industry, which currently accounts for about 20 % of all greenhouse gas emissions.

While the sector has seen a steady decrease in emissions since the 1990s, that decline isn't fast enough. To meet its climate objectives, the EU must accelerate the pace of its industrial sector's decarbonisation.

The Green Deal Industrial Plan supports the development of the innovative processes, state-of-the-art technologies, and outside-the-box ideas – including those highlighted in this chapter – that will help decarbonise industry and accelerate its transition to climate neutrality.

Innovation for green industry

On the process side of the equation, the **STEELANOL** project has developed a novel way to recycle industrial waste gases. Installed directly into a steel plant, the system captures gases that were once emitted into the atmosphere and converts them into bioethanol, a renewable fuel that can be used to power vehicles.

These biofuels could eventually be shipped via the innovative logistics process developed by the **CO2NTROL** project. The end-to-end solution supports everything from negotiating sustainable transport options to offsetting carbon emissions and identifying the most efficient delivery routes.

Industry's environmental footprint extends well beyond carbon emissions. In addition to other polluting chemicals and gases, it also produces a significant amount of waste, including large amounts of plastics.

Instead of heading to landfills, this plastic could be used to produce new plastic products through work carried out by the **PULSE** project. The project developed circular technologies to pretreat and upgrade liquefied waste plastic. The resulting hydrocarbons can be used to manufacture new plastic products, opening the door to the recycling of nearly 6 million tonnes of industrial plastic waste.

Outside-the-box ideas

When it comes to decarbonising industry, one cannot ignore its substantial energy demand. While it might be challenging to make a single industrial site more efficient, industry tends to operate in clusters. So, why not cooperate?

This is the innovative thinking behind the **R-ACES** project. Knowing that there's strength in numbers, the project is turning industrial parks and clusters into ecoregions. By facilitating the exchange of surplus energy, making extensive use of renewable energy, and installing shared smart energy technology, R-ACES is confident these industrial ecoregions will see a 10 % drop in emissions.

Together, these projects are helping to ensure that Europe's industrial products don't cost the Earth.



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Turning industrial pollution into green fuel

Turning steel waste gases into enough bioethanol to fuel a half a million cars may sound like science fiction, but in fact it is exactly what the STEELANOL project aims to do.

Using an innovative process installed at a new steel plant in Belgium, the project has demonstrated that industrial waste gases can be recycled and fermented to produce bioethanol, an eco-friendly petrol substitute. The new mill is expected to produce around 80 million litres of bioethanol annually. The greenhouse gas impact of this production is believed to be more than 65 % lower than that of oil-derived fuels, the equivalent of turning 100 000 cars on the road electric every year.

STEELANOL

Project name

Production of sustainable, advanced bio-ethANOL through an innovative gas-fermentation process using exhaust gases emitted in the STEEL industry

Funded under

Horizon 2020-ENERGY

Coordinated by

ArcelorMittal Belgium in Belgium

Duration

1 May 2015 – 31 March 2024

Find out more

steelanol.eu

The power of energy cooperation

Although industry accounts for 25 % of Europe's energy demand, only 16 % of this demand is met using renewables.

By focusing on collective measures and clustering, the R-ACES project aims to exponentially increase the industrial sector's energy efficiency. To do so, it's working to turn high-potential industrial parks and clusters into fully fledged ecoregions. By encouraging the exchange of surplus energy, making extensive use of renewables, and facilitating cooperation using a smart energy management system and other tools, the project is confident these newly established ecoregions can reduce emissions by at least 10 %.

R-ACES

Project name

fRamework for Actual Cooperation on Energy on Sites and Parks

Funded under

Horizon 2020-ENERGY

Coordinated by

Institute for Sustainable Process Technology in the Netherlands

Duration

1 June 2020 – 31 March 2023

Find out more

r-aces.eu



Recycling plastics to curb CO₂ emissions

By turning plastic waste into hydrocarbons that can be used to produce new plastic products, the PULSE project is helping keep plastic out of landfills.

The project has developed innovative technologies for pretreating and upgrading liquefied waste plastic. Once integrated into a refinery's chemical recycling process, this circular technology will decrease CO₂ emissions and help reduce Europe's dependence on fossil fuels.

By enabling the recycling of more than 5.9 million tonnes of otherwise hard-to-recycle plastics, the PULSE chemical recycling process will result in a total greenhouse gas saving of 10.3 metric tons of CO₂ equivalent during its first 10 years of operation and save 3.95 million tonnes of virgin fossil raw materials.



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PULSE

Project name

Pretreatment and Upgrading of Liquefied waste plastic to Scale up circular Economy

Funded under

Innovation Fund

Coordinated by

Neste in Finland

Start date

1 April 2022

Find out more

bit.ly/EU-PULSE

The logistics of going green

The route to more sustainable shipping and logistics starts with options – which is what the CO2NTROL project seeks to provide.

The project is developing a fully integrated, end-to-end solution that importers and exporters can use to plan, manage and track shipments, all with a minimal impact on the environment. The comprehensive solution covers every step of the process, from negotiating sustainable transport options with carriers to offsetting carbon emissions. It also uses data to help users identify the most optimal route from pick-up to delivery, further helping the sector reduce its carbon footprint.

CO2NTROL

Project name

Collaborative platform for shipping container operations to take control of CO2 emissions by route optimisation

Funded under

EMFF-Blue Economy Window

Coordinated by

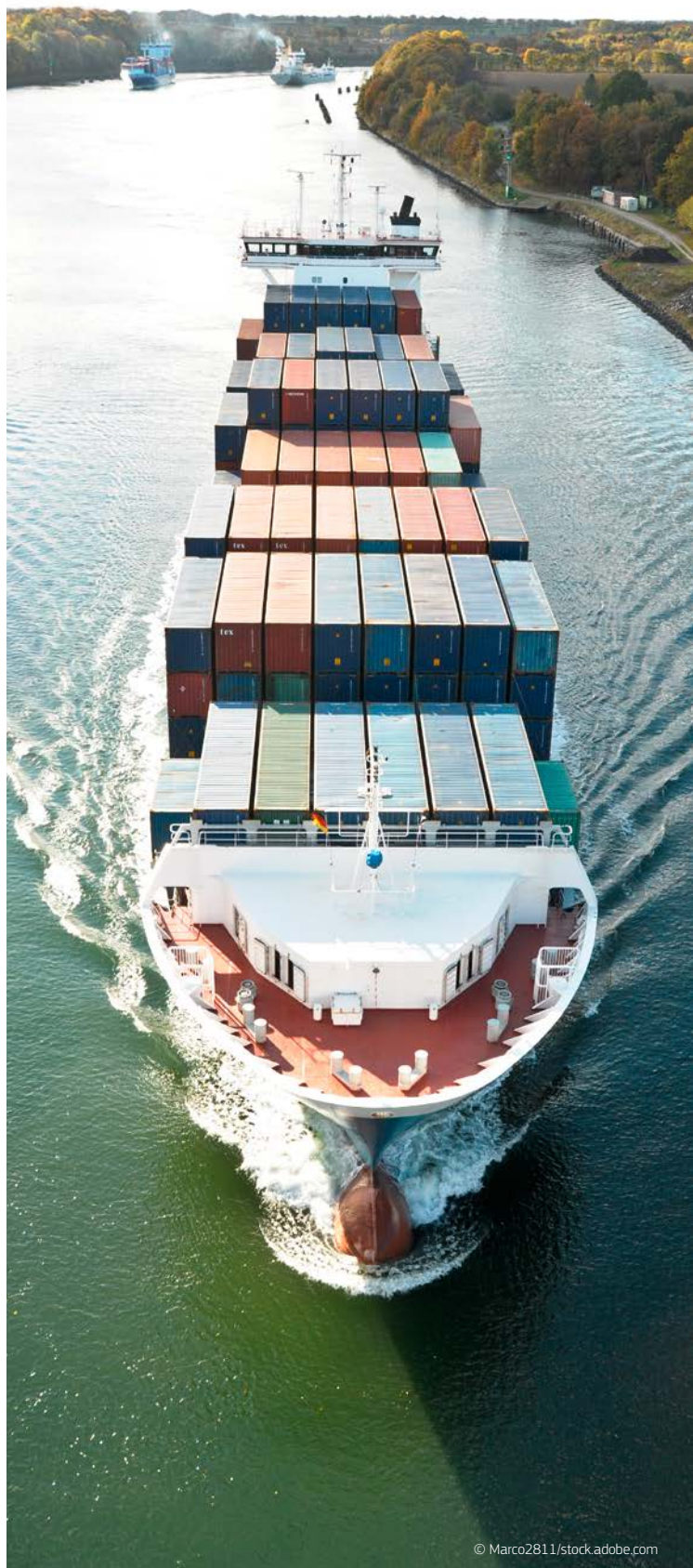
BUYCO in France

Duration

1 August 2021 – 31 October 2023

Find out more

buyco.co/co2ntr0l



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