GREEN POWERED FUTURE
MISSION

Flagship Project 1:
5 Demos In Five Continents

NATIONAL PILOTS REPORT

JULY 2023

DISCLAIMER

The Green Powered Future Mission members contributed with relevant information to the development of this National Pilots Report ("Report" in the following), as part of their commitment to the mission's Flagship Project 1 (FP1) "5 demos in five continents". Please note that this Report does not represent the views of any specific Green Powered Future Mission member country, entity or organisation or their members or the governments they represent.

This Report is intended to support and inform policymarkers by showcasing selected ongoing or planned national pilot projects fully aligned with the innovation priorities identified by the mission, thus confirming the worldwide wealth of activity and effort to accelerate the energy systems transformation and decarbonisation. However, this Report does not constitute professional advice on any specific issue or situation. Green Powered Future Mission members make no representation or warranty, express or implied, in respect of the Report contents (including its completeness or accuracy) and the members shall not be responsible for any use of or reliance on it. Any use, reproduction, publication or reprint, in whole or in part, of this document and the information contained therein, is permitted only for pedagogical, scientific or non-commercial purposes, provided that the Green Powered Future Mission and this Report are duly mentioned and cited as source.

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Martini provides technical support to the Italian Ministry of Environment and Energy Security, has a vast experience in international cooperation activities and has been repeatedly recruited as independent expert to review publicly funded R&I projects.

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Dr. Wang is actively involved in international collaborations as the Affordable and Reliable VRE Technology Lead of the Green Powered Future Mission, the Chinese co-lead of the "Smart Grids Innovation Challenge," and a Chinese expert of IEA TCP PVPS. He has successfully led numerous national and provincial projects, including those under the National Key Research and Development Program.

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Sarah Butler is an Energy Innovation Programme Manager within the UK Government Department for Energy Security & Net Zero. She leads innovative programmes and projects seeking to support a smarter, more flexible and decarbonised energy system. This includes the up to £65m Flexibility Innovation Programme, part of the UK Government's £1bn Net Zero Innovation Portfolio which is providing funding for low-carbon technologies and systems. Sarah has worked in climate change and low carbon energy at international, national and local levels, including climate change mitigation policy and economics at the United Nations, EU Horizon smart city demonstrator programmes, and delivering innovative local low carbon technologies and infrastructure.

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INTRODUCTION

Electricity plays a critical role in driving the **global energy transition** and hence the need for demonstrating innovative solutions for their grid implementation and broad replication is more pressing than ever. Energy systems worldwide must undergo significant changes to meet greenhouse gas emission reduction targets, and promote mass grid integration of renewable energy. It is therefore important that governments prioritise grid-related research, development and demonstration of clean energy technologies, and that such activity is a significant part of energy and climate policies. Mission Innovation **Green Powered Future Mission** (GPFM) is a public-private partnership with members from countries, private sector companies and international organisations. It aims to demonstrate that by 2030, power systems in different geographies and climates can effectively integrate up to 100% variable renewable energies (VRE), like wind and solar, in their generation mix, and maintain a cost-efficient, secure and resilient system.

The GPFM is a 10-year endeavour launched in June 2021 which will accelerate innovation in clean energy by demonstrating innovative solutions to transform the present power system. It is organised around three Research and Innovation (R&I) pillars covering the whole spectrum of power system innovation needs:

- Pillar 1 - **Affordable and reliable VRE**
- Pillar 2 - **System flexibility and market design**
- Pillar 3 - **Data and digitalisation for system integration**

Following the launch of GPFM, at COP26 in Glasgow, the Mission released the **Joint Roadmap of Global Innovation priorities**, identifying the top 100 innovation priorities that the Mission should concentrate efforts upon to help achieve its 2030 aim.

These Innovation Priorities formed the basis of the **Action Plan 2022-2024**, published in September 2022 at Global Clean Energy Action Forum (GCEAF) in Pittsburgh, setting out the actions GPFM members will take between 2022 and 2024, which includes:

- R&I activities in the top 50 most urgent GPFM Innovation Priority areas;
- Flagship Project FP1 "**5 demos in five continents**";
- Flagship Project FP2 "**Multilateral Research Programme**";
- Engagement with other International Initiatives.

This report is the first deliverable from the action plan and focusses on FP1 "5 demos in five continents". It sets out how GPFM is delivering against this action. It is intended as an introductory deliverable, alongside and ahead of planned reporting against the Mission Action Plan – the Yearly Action Plan Update. The main goal of Flagship Project 1 is to launch 5 large-scale demonstrations of innovation activity in the five continents of Asia, Australia, Europe, North America, and South America. **25 GPFM members**, including member countries, private sector companies and international organisations, have committed to delivering this flagship project.

Demos are made up of **national pilots,** of a scale of Millions of Euro, launched after Q1 2021 and aimed at reaching TRL 6-7. National pilots involve multiple partners such as technology service or product providers and network operators, and sharing learning and best practices. Each of these anticipated national pilots is tackling one or more of the **50 most urgent Innovation Priorities** of the Mission and is driving towards up to 80% VRE integration.
They are covering a range of innovation challenges such as: breakthrough in affordable and reliable VRE technologies, unlocking of and cooperation among different flexibility sources, data effective exploitation, new market design, innovative regulatory frameworks and the interaction with other energy vectors towards a fully integrated system.

By delivering innovation action in this way, the national pilots will be demonstrating different innovative technical, regulatory and market solutions and how they may be implemented and validated in different climates and geographies. The sharing of learning by national pilots, within and amongst continental demos and wider, in innovation priority areas crucial to a green powered future, will galvanise progress towards the GPFM aim.

The Demos are also supported by **continental task forces**, i.e. groups set up to help map out and report on the specific innovation priorities addressed by each pilot and facilitate sharing of learning as national pilots are delivered.
Each chapter of the following report introduces the national pilots which make up each of the continentaldemos,outliningthedecarbonisation targets, innovation activities, and details of the national pilots, of the GPFM member countries, private sector and international organisations which have committed to delivering FP1 "5 demos in five continents".

References and useful links

[September, 2022]
The Green Powered Future Mission released at the GCEAF (Pittsburgh, U.S.) the Action Plan 2022-2024

[July, 2022]
The Green Powered Future Mission contributed to the first Private Sector Engagement Workshop, to further strengthen the private sector commitment.

[November, 2021]
The Green Powered Future Mission released at COP26 (Glasgow, UK) the Joint Roadmap of Global Innovation Priorities

[June, 2021]
The "Green Powered Future" Mission was announced at the Sixth Mission Innovation Ministerial

[June, 2021]
Joint Statement

Green Powered Future Mission launch videos

Green Powered Future Mission website

GPFM LinkedIn page

1. NATIONAL PILOTS SURVEY: MAIN OUTCOMES

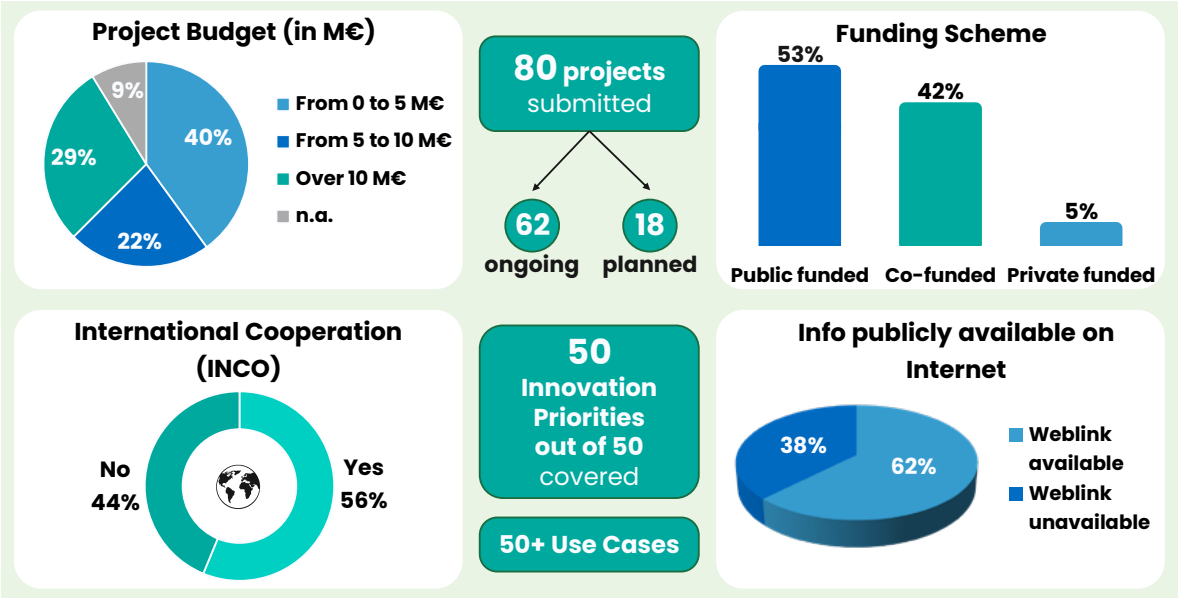
As part of the development of its Flagship Project 1 "5 demos in five continents", the Green Powered Future Mission started a process to collect relevant information about coalition members pilot projects fully aligned with the Mission's scope and objectives. The main information about ongoing and planned GPFM members' national pilot projects, tackling one or more of the 50 most urgent Innovation Priorities identified in the Action Plan 2022-2024, has been collected through a National Pilots Survey.

This survey exercise was very well received by the GPFM coalition and allowed to collect a broad range of responses by 25 GPFM members from **12 different countries** and detailed information related to **80 pilot projects** either ongoing or foreseen to be launched by Q4 2024.

For each of the 80 national pilots the following information has been collected and analyzed: title, acronym and short description, starting date, duration, coordinator and main involved partners, funding scheme (public, private or co-funded), overall budget (M€), openness to International Cooperation, and website link. Moreover, the respondents to this survey have been requested to indicate the main R&I themes and Innovation Priorities tackled by the projects, as well as most relevant High-Level Use Cases. The main outcomes of the National Pilots Survey, which laid the ground for the present report, are summarised in the figure reported in this page. First of all, the number of collected national pilot projects largely exceed the initial GPFM expectations reported in the mission's Action Plan 2022-2024: 80 versus 20+. Moreover, this survey showed that the 80 presently collected projects cover **all the 50 Innovation Priorities** identified in the GPFM Action Plan 2022-2024 and reported in the Appendix I.

Regarding the pilot project budget, the survey evidenced that the majority of the submitted projects have a budget between 1 to 5 M€ (40%), but a significant portion of projects (29%) have a budget larger than 10 M€. The survey showed that an important portion of projects are supported by public funding (53%) including 18% of EU fundings, public-private (co-funded) projects account for 42%, and privately funded projects account for the remaining 5%. More than 60% of projects have a dedicated website with publicly available information; moreover, it is very promising for the future GPFM activities that a large fraction of the pilot projects (56%) is open to **International Cooperation**. The collected pilot projects that are fully aligned with the Mission's goals and priorities will constitute the building blocks of the FP1 continental demos that are expected to address power systems with up to 80% VRE in different geography and climate.

National Pilots Survey in figures



2. CONTINENTAL DEMO PROJECTS

In this chapter, as part of FP1 "5 demos in five continents" we report on 80 ongoing or planned on planned national pilot projects fully aligned with the Mission's scope and priorities as identified by GPFM members.
Each of the selected projects tackles one or more of the 50 most urgent Innovation Priorities identified in the GPFM Action Plan 2022-2024, thus spanning all the Mission's three R&I pillars.
At this initial stage, FP1 national pilot projects are expected to search, implement, and demonstrate innovative solutions allowing reliable and secure operation of power systems located in at least 5 different continents with up to 80% VRE.
By delivering their innovation action, the national pilots will demonstrate different innovative technical, regulatory and market solutions and how they have been implemented and validated in different climates and geographies. The pilots of GPFM members that contribute to FP1 "5 demos in five continents" have been grouped as follow:

- 2.1 **Asian National Pilots**
- 2.2 **European National Pilots**
- 2.3 **North & South America and Australia National Pilots**
- 2.4 **International Organizations Pilots**

The following national pilot projects laid the basis for the development of Flagship Project 1 "5 demos in five continents". The sharing of learning by national pilots, and within and amongst continental demos, in innovation priority areas crucial to a green powered future, **will galvanise progress** towards the GPFM aim to demonstrate that by 2030, power systems in different geographies and climates can effectively integrate up to 100% variable renewable energies in their generation mix, and maintain a cost-efficient, secure and resilient system.

2.1 ASIAN NATIONAL PILOTS

This section introduces GPFM Asian coalition members decarbonization strategy and reports on National Pilot projects fully aligned with the identified Innovation Priorities

CO-LEAD

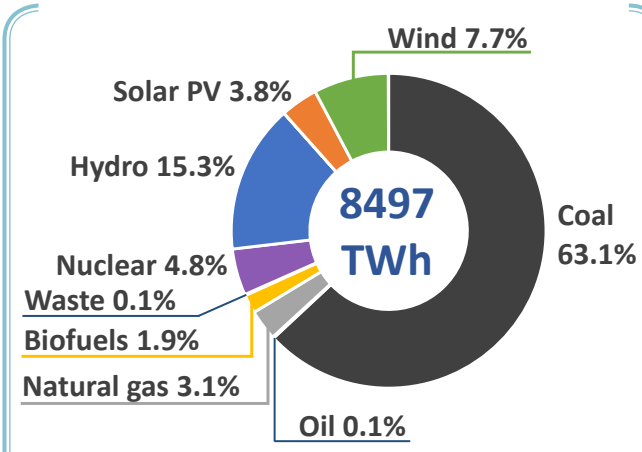
CHINA

Decarbonisation targets

China is firmly committed to combat climate change with ambitious carbon targets. By 2030, it aims for peak carbon dioxide emissions and carbon neutrality by 2060. By 2030, China has committed to reducing CO_2 emissions per unit of GDP by over 65% from 2005 levels, while targeting a 25% share of non-fossil energy consumption.
Plans include increasing forest stock by 6 billion cubic meters and exceeding 1.2 billion kilowatts in wind and solar power capacity.
China's efforts reflect its crucial role in addressing climate change and pursuing sustainable development.

Main innovation activities

China exemplifies an unwavering commitment to decarbonization through innovative initiatives. Ministry of Science and Technology of China supported various innovation projects in renewable energy, hydrogen technology, smart grid, and clean utilization of coal technologies.
The projects received significant public funding, with a focus on areas like hydrogen energy, solar and wind coupling, smart grid technology, multi-user electricity consumption, off-grid housing energy storage, and zero-emission robotics. Additionally, China engaged in international cooperation with countries like the US, Japan, South Korea, and European nations to invest in energy efficiency, renewable energy, electric and hydrogen vehicles, clean thermoelectric technology, and other areas of mutual interest.



Electricity generation mix (IEA data 2021)

China Pilot #1

Project name / acronym

The "Green-Powered Future" Mission Cooperation Project

Project short description

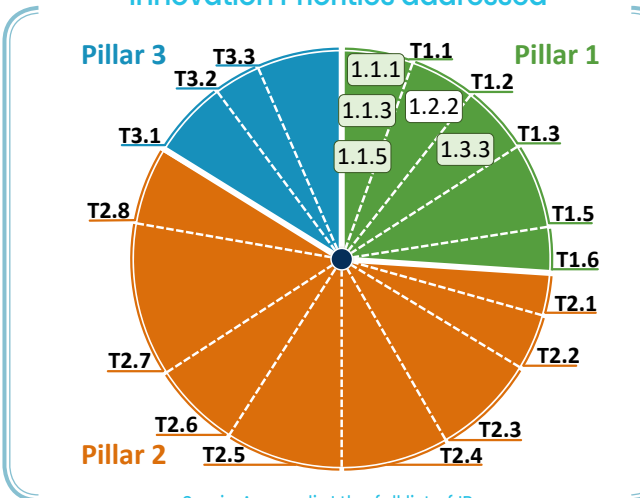
The China Pilot program is dedicated to driving greener technological innovation and fostering multilateral international cooperation in the field of renewable energy. By doing so, it aims to further advance the global adoption and development of sustainable energy solutions. With a primary focus on offshore wind power and photovoltaic systems, the program undertakes the implementation and testing of various renewable energy technologies. This section provides an overview of the key tasks and objectives of the China Pilot program.

1) Design, simulation and optimization of large-scale offshore wind power as well as testing platform;
2) Design, simulation and optimization of novel photovoltaic technologies as well as field testing platform;
3) Design, control and stability of novel DC power system for offshore renewables as well as testing platform;
4) Power generation performance monitoring and environmental and ecological impact monitoring of large-scale offshore wind and photovoltaic system;
5) GPFM Internet-based Platform.

Main involved partners

IEECAS (CN), LONGi (CN), Goldwind (CN), RSE (IT)

Innovation Priorities addressed



See in Appendix I the full list of IPs

CORE MEMBER

INDIA

Decarbonisation targets

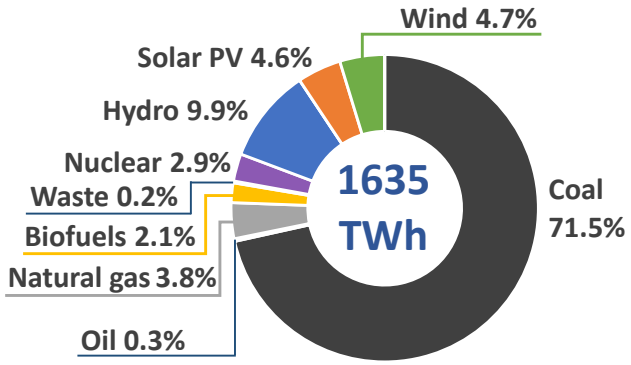
India envisions a future of sustainability, aiming for Net Zero Emissions by 2070. In addition, short-term targets are:

- 500 GW renewables capacity by 2030
- 50% energy from renewables by 2030
- 1 billion tonne emission reduction by 2030
- 45% lower emissions intensity of GDP by 2030
- 5 MMT/year green hydrogen production

These ambitious goals assimilate a transformation narrative, harmonizing clean energy, economic growth, and ecological preservation. India paints a picture of a vibrant, responsible future where ambition and responsibility intertwine to create a masterpiece of sustainability.

Main innovation activities

To fast forward India's decarbonisation targets, India has launched several innovative missions including National Solar Mission, National Mission on Electric Mobility and Battery Storage, National Mission for Enhanced Energy Efficiency and Sustainable Habitat, and National Hydrogen Mission etc. The Department of Science and Technology has initiated a series of R&D programs in smart grid, renewable energy, clean coal technologies, storage system, Carbon Capture Utilisation and Storage (CCUS), and green hydrogen with national and international collaboration. The Ministry of New and Renewable Energy has initiated 17 R&D projects under RE-RTD program with an emphasis on affordable, reliable, and efficient RE systems and components.



Electricity generation mix (IEA data 2021)

India Pilot #1

START Q3 2021 — Q4 2024

1.68 M€ Co-funded | INCO

Project name / acronym

Sustainable Energy System for Achieving Novel Carbon Neutral Energy Communities / SUSTENANCE

Project short description

The SUSTENANCE project aims to develop and demonstrate sustainable multi-energy vector based clean local energy system. This project focuses on the development of smart technological concepts enabling a green transition of energy systems with a higher share of local renewable energy. The project includes 3 demonstration sites in India and 3 in Europe. The main goals of the project include decarbonisation of local energy systems via optimal integration of locally available renewables, integration of energy systems for local communities, technical benchmarking and solutions matched with viable business models tailored to the different challenges and actors identified in each country, evaluation of solutions from the demonstration sites for replicability across India, Europe & worldwide, and emphasis on user involvement, including the identification of the conditions and socio-economic characteristics behind the willingness to participate.

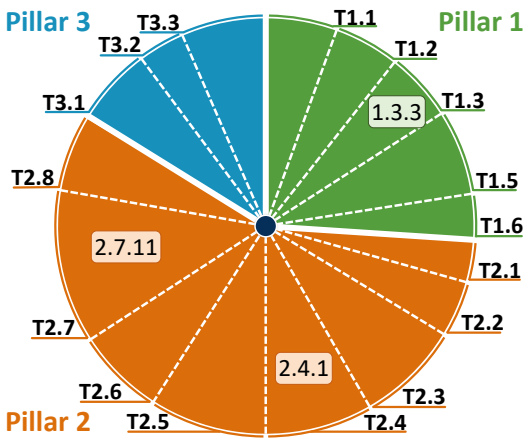
Main involved partners

- IIT Bombay (Indian Coordinator)
- Aalborg University Denmark (EU Coordinator)
- Indian Partners (IISC Bangalore, IIT Delhi, IIT Kharagpur, NIT Trichy, NIT Silchar, VNIT Nagpur, MNNIT Allahabad, Gram Oorja)
- Other EU Partners (University of Twente, Saxion University of Applied Science, The Institute of Fluid-Flow Machinery of the Polish Academy of Sciences, Skanderborg Kommune, Neogrid, Aura Energi, Energa-Operator SA, Stay-ON Energy Management, Aura Energi)

Web link

https://h2020sustenance.eu

Innovation Priorities addressed



See in Appendix I the full list of IPs

India Pilot #2

START Q3 2021 — Q4 2024

1.08 M€ Co-funded | INCO

Project name / acronym

Renewable Energy Empowering European & Indian Communities / RE-EMPOWERED

Project short description

The overarching goal of RE-EMPOWERED is to develop a set of hardware and software solutions (called as ecoToolsets) namely ecoEMS, ecoMicrogrid, ecoPlanning, ecoDR, ecoPlatform, ecoConverter, ecoMonitor, ecoCommunity, ecoVehicle, and ecoResilience for efficient, de-carbonized and RES-intensive multi-energy local energy systems.

The objective of the RE-EMPOWERED project is organized in 3 pillars, Pillar 1: Increased energy efficiency, RES utilization, and reliability; Pillar 2: Fostering sustainable and economic community development; Pillar 3: Exchange, replicability, and scalability in EU and India. Key deliverables of the project are as follows: development of ten different ecoToolsets having high TRL (7-9) for performance improvement of microgrids, deployment and demonstration of the above ecoToolsets at four demo sites, a business model for better sustainability and replicability of the developed microgrids.

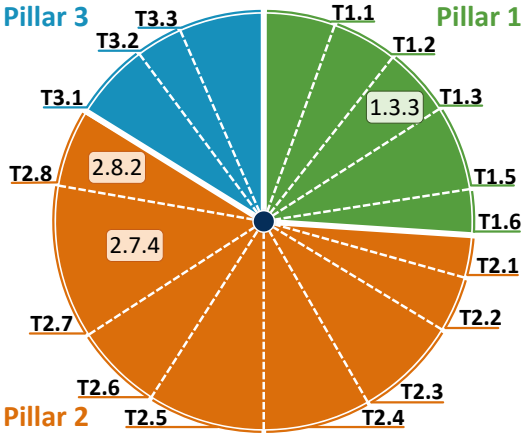
Main involved partners

- Indian Institute of Technology Kharagpur (Indian Coordinator)
- ICCS-NTUA (EU Coordinator)
- Other Indian Partners (IIT Bhubaneswar, VNIT, CSIR-CMERI, IISC Bangalore, IIT Delhi, Lab Concern India)
- Other EU Partners: Imperial College London, Danmarks Tekniske Universitet, Bornholms Varme As, PROTection Applications & Studies Industrial Services S.A (PROTASIS), Deloitte Advisory S.L. (DELOITTE), Network of sustainable Greek islands (DAFNI)

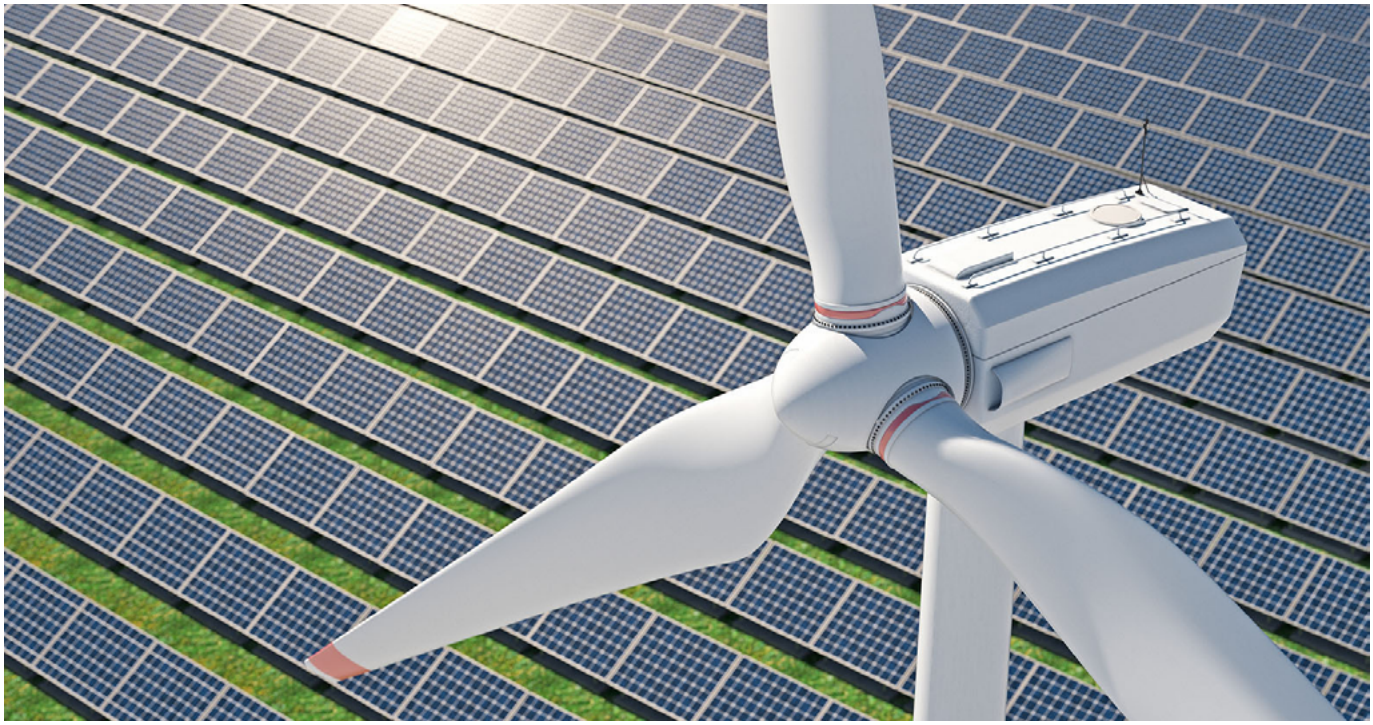
Web link

https://reempowered-h2020.com

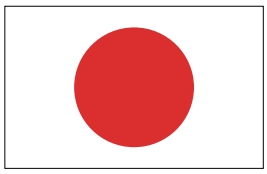
Innovation Priorities addressed



See in Appendix I the full list of IPs



SUPPORT MEMBER



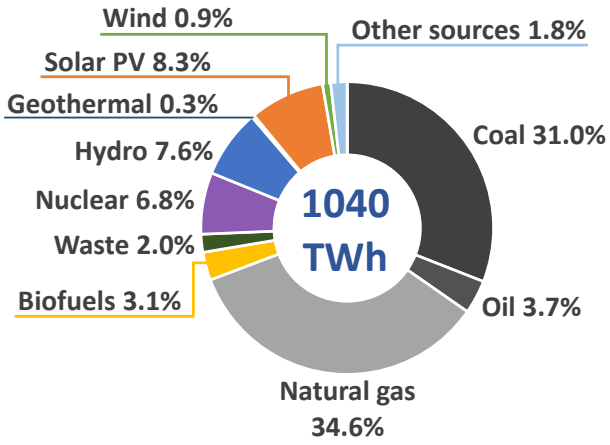
JAPAN

Decarbonisation targets

Japan's GHG reduction target in Fiscal Year FY2030 is 46% from FY2013 level, aiming for further reduction of 50%.
The total electricity generation in FY2020 was 1,008 billion kWh, with 39.0% from Liquefied Natural Gas (LNG), 31.0% from coal, 6.4% from oil, and 7.8% from hydro, 12.0% from renewables (excluding hydropower), and 3.9% from nuclear. The total electricity generation for FY2030 is expected for 934 billion kWh, with a renewable target of 36-38%. The rest of the supply is expected to be 20-22% from nuclear, 20% from LNG, 19% from coal, 2% from oil, and 1% from hydrogen and ammonia power.

Main innovation activities

Innovation projects that contribute to achieving the FY 2030 renewable target and Carbon Neutrality by 2050 are funded by NEDO (New Energy and Industrial Technology Development Organization) as "Japan's Green Innovation Fund" (2 trillion yen over 10 years). The key projects include "Cost Reductions for Offshore Wind Power Generation", "Development of Next-Generation Solar Cells" and "Hydrogen Production through Water Electrolysis Using Power from Renewables". To integrate high ratio of Variable Renewable Energies to the grid, NEDO funds R&D projects to develop next-generation grid technologies, such as smart inverters, large-scale batteries, electrolyzers, and hydrogen storage, and also promotes the utilization of these technologies in international smart community demonstrations in Europe, North America, and Asia.



Electricity generation mix (IEA data 2021)

Japan Pilot #1

START Q2 2022 → Q2 2027

11 M€ (FY 2022) | Public funded

Project name / acronym

Future-generation power network Stabilization Technology development for utilization of Renewable Energy as the Major power source / STREAM

Project short description

Based on the outcomes of the prior project (Next-Generation Power Network Stabilization Technology Development), the STREAM project aims to develop key technologies that are essential to achieve Japanese government's 2030 target of 36-38% for renewables in grid mix and 2050 target of carbon neutrality. The key technologies include countermeasures for decreasing grid inertia due to the decreasing share of synchronous generators in the grid, and for short circuit capacity. STREAM project aims to develop next-generation inverters with a Grid Forming ability, which simulate inertial force for grid stability. Under STREAM project, these technologies will also be demonstrated at small-scale grids after the development phase.
The project is funded by Agency for Natural Resources and Energy (ANR) of the Ministry of Economy, Trade and Industry (METI), and executed by New Energy and Industrial Technology Development Organization (NEDO).

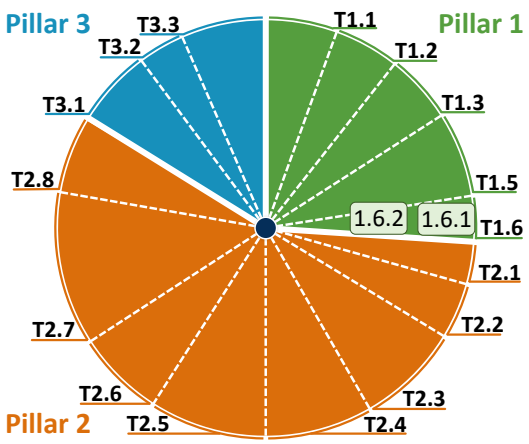
Main involved partners

Tokyo Electric Power Company Holdings (JP), Central Research Institute of Electric Power Industry (JP)

Web link

https://www.renewable.pr.aist.go.jp/ent/project/nedo_gfm

Innovation Priorities addressed



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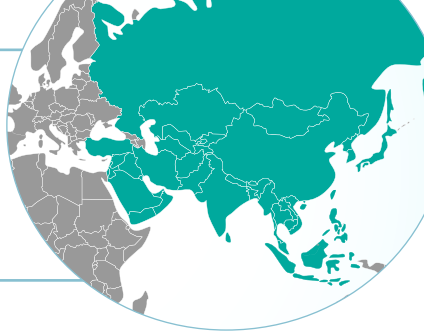
SUPPORT MEMBER

REPUBLIC OF KOREA

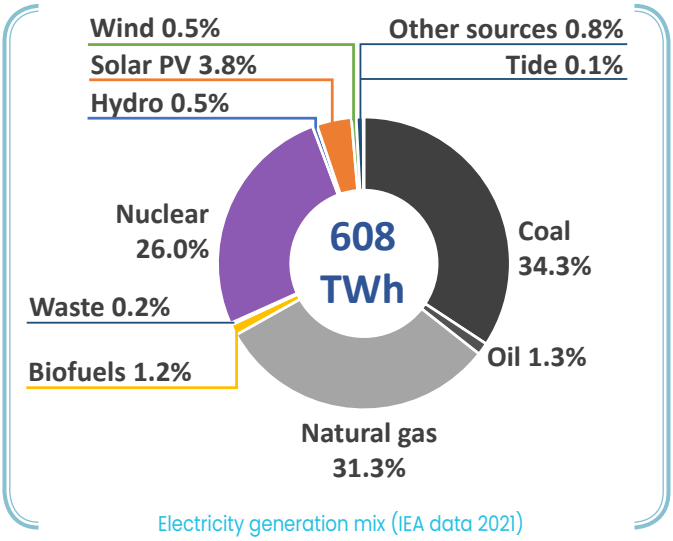


Decarbonisation targets

To achieve net zero emissions by 2050, the Republic of Korea sets an emission target 40% below 2018 levels at 436.6 million tons by 2030, which is the NDC target submitted in 2021.
The latest draft of the National Net Zero and Green Growth Plan released in March 2023 outlines the government's key strategies to achieve the target including an increase of nuclear power and renewable energy generation, reduction of coal power generation, adoption of carbon-free power sources, and others.

Main innovation activities

The Republic of Korea is actively carrying out energy technology innovation activities across renewable energy, hydrogen, fuel cells, EV charging, nuclear power, resources development, energy safety, and others.
Key ongoing development activities in renewable energy cover the area of bifacial PV module technology and 8MW offshore wind power generation systems.
Recent R&D activities in the EV charging field include the development of an ultra-fast EV charging infrastructure with demonstration-focused R&D investment.



Electricity generation mix (IEA data 2021)

Korea Pilot #1

START Q2 2022 → Q2 2026

7 M€ Co-funded

Project name / acronym

Development of an electric vehicle battery interaction station, and a Development & Demonstration of a smart charging / DISCHARGING

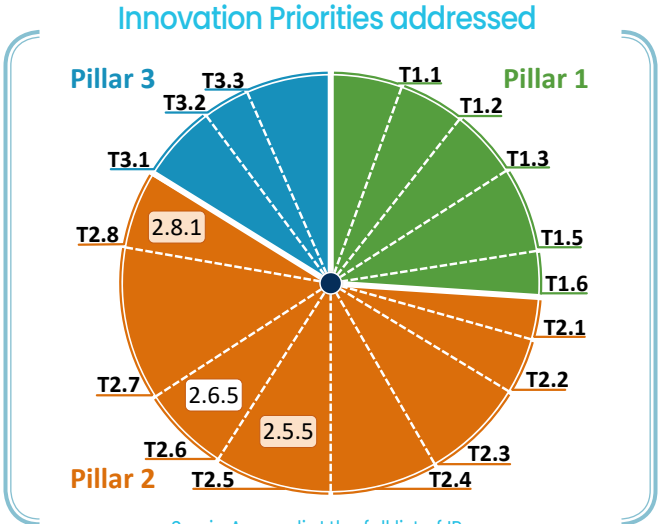
Project short description

The objective of this project is to demonstrate the resolution of output curtailment due to excessive generation of renewable energy for collective flexible resource type Plus DR power trading through establishment of a power to mobility technology integrated platform and business model development. To achieve the objective, this project will research and develop the following: establishment of convergence charging station for each demonstration purpose, development of smart charging technology and UBESS system, business model evaluation and verification. Demand resources include approximately 3,200 chargers, UBESS system for 20 electric vehicles, and 17 complex building resources. In addition, we plan to secure a total of 3,000 electric vehicles to increase demand and proceed with demonstration. Through this, the consortium aims to absorb renewable electricity equivalent to 7% of the total curtailment. These activities are expected to activate the market through a service model based on distributed energy in ROK.

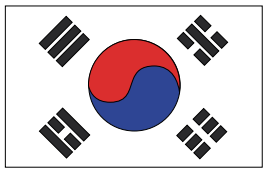
Main involved partners

Gridwiz, Korea Electronics Technology Institute, Korea Power Exchange, Hanwha Energy Corporation, E2Z, ChargEV, GridM, Jeju Technopark, Gwangju Institute of Science and Technology, Korea Energy Economics Institute

Innovation Priorities addressed



See in Appendix I the full list of IPs



SUPPORT MEMBER

REPUBLIC OF KOREA

Korea Pilot #2

START Q2 2021 — Q2 2025

3.7 M€ Co-funded

Project name / acronym

Development of specific technological know-how and testing of used batteries for 2MWh ESS in the renewable energy segment

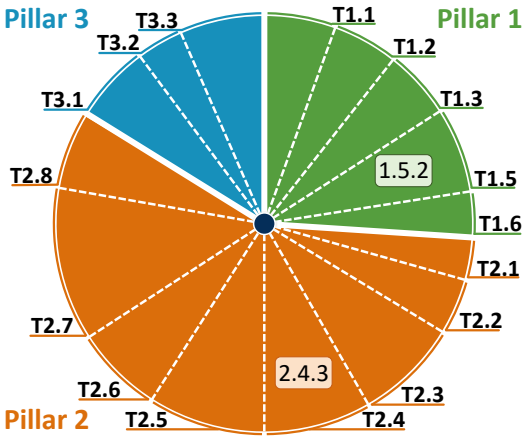
Project short description

This project aims to develop and demonstrate PV linked 2MWh Energy Storage System (ESS) technology using reused and retrofit batteries. To achieve the objective, this project will conduct and develop the followings: ESS system design, battery management system development and verification, remanufacturing ESS standard development, establishment of 2MWh ESS linked to renewable energy. The basic design is to create a new ESS by examining the remaining State of Charge (SoC) targeting the lithium-ion battery extracted from the ESS that was used with the EV vehicle for the reusable battery. Organizations participating in this project are researching technical details on sorting technology and recombinant technology using batteries from each model of Tesla, BMW, and Hyundai Motors. At this time, the cooling method and safety review are given priority through the application of BMS optimized for batteries from different sources and the design of modules and racks, and the price competitiveness of the reusable battery system produced is also considered.

Main involved partners

Bosung Powertec Co. Ltd., Green Energy Institute, Incell, BioCOEN, Korea Battery Research Association, Samsung SDI Co., Ltd.

Innovation Priorities addressed



See in Appendix I the full list of IPs

CORE MEMBER

GOLDWIND

GOLDWIND

Involved Sector

As a trusted global strategic partner in clean energy, Goldwind is committed to building an energy foundation to "drive a renewable future" centred on the Ecology-Oriented Development + ENERGY clean energy industry model, with reliable products and solutions in energy development, devices, services, and utilization.

Decarbonisation targets

Goldwind has set ambitious decarbonization goals to reduce its carbon emissions and promote sustainable development.

As a responsible corporate citizen, Goldwind promises to achieve carbon neutrality at the operational level in 2022, reduce carbon intensity by 25% in 2025 compared with 2020, achieve 100% green power for Goldwind products produced by major suppliers in 2025, and realize 100% recycling and reuse of Goldwind products in 2040. In addition to its main target of achieving carbon neutrality by 2050, Goldwind is dedicated to facilitating the transition from fossil fuels to renewable energy sources, such as wind and solar power.

Main innovation activities

Goldwind has accumulated years of independent research and development innovation capabilities. It leads renewable energy technology from introduction and follow-up to independent innovation, laying a solid foundation for further high-quality development of renewable energy. The company has set up eight research and development bases and centers, with more than 3,000 R&D technicians accounting for 30 years.

Goldwind integrates clean energy and digital technology to explore smart zero-carbon solutions for the new power system. It optimizes the generation, transmission, storage, and consumption links, innovates energy asset management modes, and supports "carbon neutrality".

CORE MEMBER

LONGi

LONGI

Involved Sector

Founded in year 2000, LONGi Green Energy Technology Co., Ltd. has evolved itself into the leading solar producer and the largest solar technology enterprise by market capitalization in the world. Industrial chain of LONGi covers mono silicon rod, wafer, cell, module, solar power station, hydrogen equipment etc.

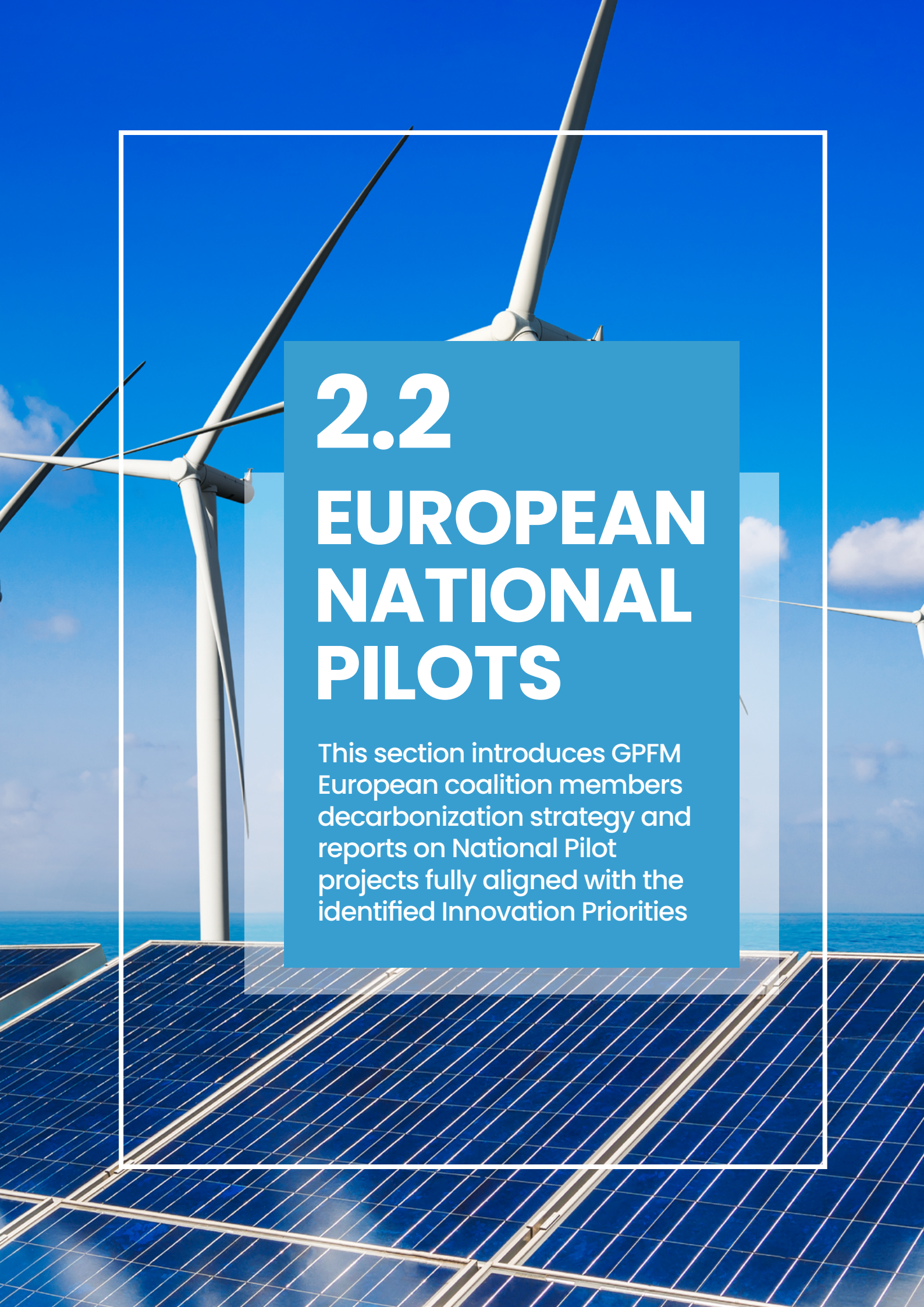
Decarbonisation targets

LONGi will supply "Green Power + Green Hydrogen" solutions for global zero-carbon development.
LONGi observes the sustainable and green development philosophy in its development course. The company it joined in RE100, EV100, EP 100 and SBTi in 2020 to fulfill its committed practices of "Zero carbon". The U.N. Sustainable Development Goals (SDGs) define the global vision and priorities for 2030. LONGi is taking action to contribute to and follow the SDGs as a responsible leader in the PV industry. Based on the global emission factor by International Energy Agency (IEA), LONGi's products have helped reduce 536 million tons of carbon emissions globally.

Main innovation activities

Since 2012 to September 2022, LONGi has invested over 20 billion yuan on R&D. By the end of 2022, LONGi has obtained 2,132 patents. Within two years from 2021 to 2022, LONGi has created 14 world records in solar cell conversion efficiency. LONGi has set a new world record of p-type Hetero-Junction Technology (HJT) silicon solar cell efficiency at 26.81%, certified by the Institut für Solarenergieforschung in Hameln (ISFH). And the maximum mass production efficiency of its innovative module product Hi-MO 6 exceeds 23.2%. LONGi has also launched alkaline electrolyzed water hydrogen production equipment ALK Hi1. It even hits 4.0 kwh/Nm^3 when the current density is 2500A/m^2.

"Achieving **carbon neutrality** will bring a transformation to our economy and society that will be led by a **scientific and technological revolution** as significant as all previous industrial revolutions."

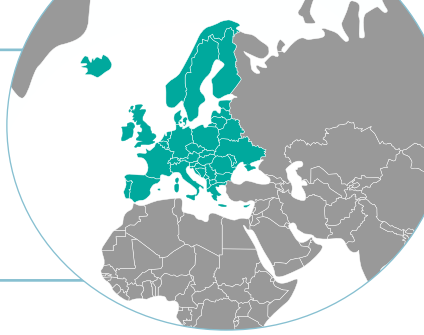


2.2 EUROPEAN NATIONAL PILOTS

This section introduces GPFM European coalition members decarbonization strategy and reports on National Pilot projects fully aligned with the identified Innovation Priorities

CO-LEAD

ITALY

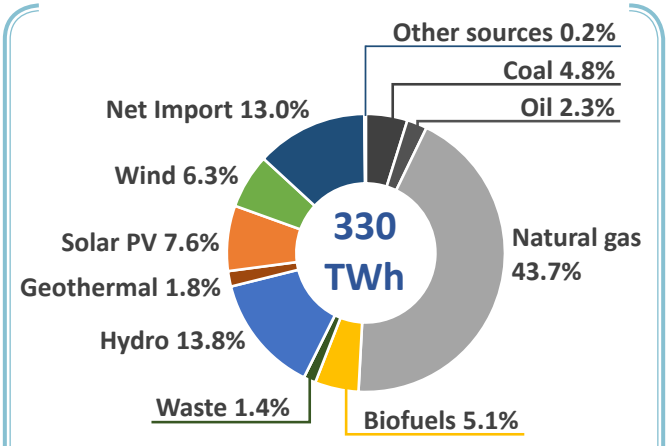


Decarbonisation targets

The Italian energy system has undergone a significant evolution in the last decades thanks to the massive deployment of VRE sources.
The 10-year integrated National Energy and Climate Plan (NECP) has set ambitious goals for the energy transition in the period from 2021 to 2030, including the phase-out of coal by 2025, the reduction of GHG emissions by 33% compared to 2005, and a considerably higher share of renewables in gross final energy consumption (30%) by 2030. NECP also refers to a full decarbonisation of Italy's energy system by 2050.
It is important to underline that as requested, in June 2023 Italy submitted to the European Commission an updated and more ambitious NECP.

Main innovation activities

An important program supporting R&D activities in the energy sector is the "National Fund for Electric System Research" (RdS), which aims to enhance competitiveness, security, and sustainability of the Italian electricity system. RdS projects are implemented by public R&D institutions, namely CNR, ENEA, and RSE in the framework of 3-year Program Agreements with the Italian Ministry MASE (Ministry of Environment and Energy Security).
RdS activity spans over the entire electric system and benefits also by contributions from Universities and R&D organizations. RdS R&D topics include energy scenarios, integration of distributed generation, energy storage, active distribution network control, automation and related ICT technologies, and system aspects of demand response. The main results from the RdS projects are publicly available.



Electricity generation mix and net import (IEA data 2021)

Italy Pilot #1 RSE

START Q1 2022 — Q4 2024
18.6 M€ Public funded
INCO

Project name / acronym

RdS – Power system evolution, planning, management, and operation

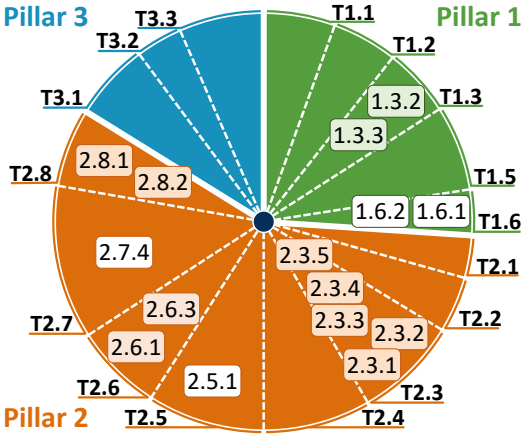
Project short description

The main fields of this project are: new system architecture, DC and AC transmission and distribution grid, observability, protection, control, monitoring, power quality, innovative technologies and superconductivity grid applications, planning (tool and methodologies development), adequacy, security, resilience, standardization activity and institutions support at national and international level.
The objective of the activities is the pursuit of an efficient management of the Italian electricity system in order to satisfy, in perspective scenarios, operational security and quality criteria, adequacy and resilience. Efficient management must guarantee minimum costs for users and involves the exploitation of renewable energy sources, in particular wind and photovoltaic energy. To exploit these variable and non-programmable energy sources, it is necessary to have a secure, resilient network infrastructure with adequate hosting capacity.

Main involved partners

Unareti, IREN, Politecnico di Milano, Politecnico di Torino, University of Cagliari, University of Palermo

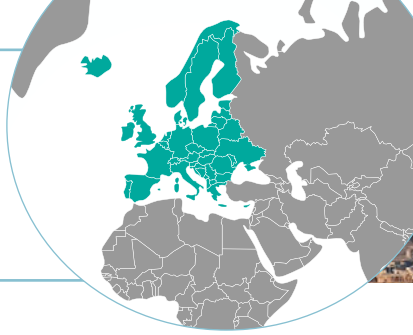
Innovation Priorities addressed



See in Appendix I the full list of IPs

CO-LEAD

ITALY



Italy Pilot #2

START Q1 2022 — Q4 2024 | 4.9 M€ | Public funded | INCO

Project name / acronym

Mission Innovation Smart Grid programme: Multivector Integrated Smart Systems and Intelligent microgrids for accelerating the energy transitiON (MISSION)

Project short description

The Programme Agreement on Mission Innovation (AdP MI) is a three-year R&I programme about smart grids based on an agreement signed by MITE with ENEA and the R&I activities are covered by ENEA, RSE and CNR. The final goal is the study, advanced design and implementation of technological solutions that enable the transition of networks towards integrated and smart multi-energy distribution systems. The project aims to develop two smart grid demonstrators, microgrid size and full scale, located, respectively, at the CR ENEA in Portici (Smart Energy Microgrid ENEA) and the RSE offices in Milan and Piacenza (Extension multi-energy of the Distributed Energy Resources Test Facility RSE). With a view to scalability and replicability, the demonstrators will be designed and built up with a modular approach, i.e. they will consist of smart subnets - nano and / or micro-sized - operating independently or interconnected.

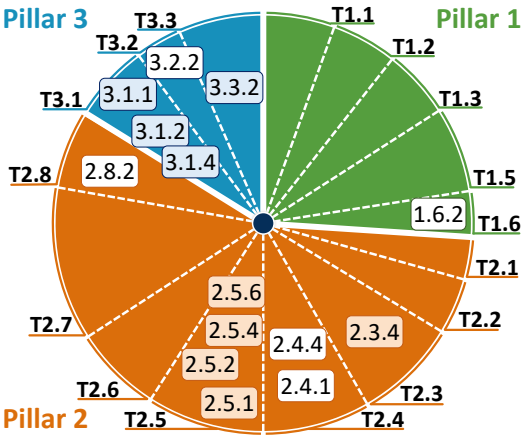
Main involved partners

ENEA (IT), RSE (IT), CNR (IT)

Web link

https://mission-innovation.it

Innovation Priorities addressed



See in Appendix I the full list of IPs

Italy Pilot #3 RSE

START Q1 2022 — Q4 2024 | 5 M€ | Public funded | INCO

Project name / acronym

RdS – Digitalization of the integrated energy system

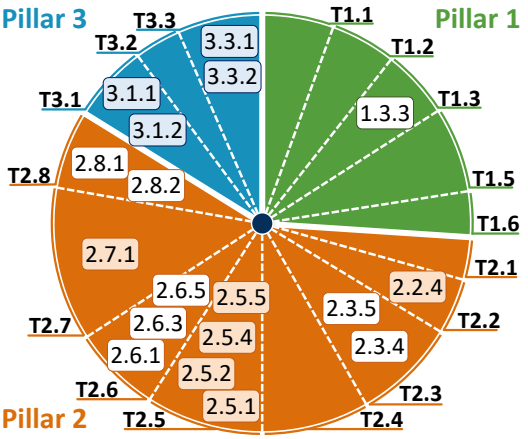
Project short description

The project deals with information and communication technologies to foster energy systems' integration and to improve the efficiency of their management and control processes. Data models and semantic tools are developed for historical and real-time data flow analysis, applying big data and artificial intelligence technologies. Digital twin models of networks and components in the electro-energy sector are also considered. End-users ICT solutions are considered for the full exploitation of the grid flexibility. Attention is paid to standardization, interoperability and development of open components and solutions. Innovative ICT technologies for scalable and efficient use of processing resources are evaluated, including Edge/Fog and Cloud computing architectures. Dynamic management of the ICT infrastructures and reconfiguration methods are studied and tested to ensure the desired level of resilience. Emerging 5G communications technologies are applied and tested, and potential use of quantum communications are also investigated.

Main involved partners

Ugo Bordoni Foundation, Terna, Unareti, Areti, IREN, e-Distribuzione, Politecnico of Milan, Politecnico of Turin, University of Pavia, Aachen University

Innovation Priorities addressed



See in Appendix I the full list of IPs

Italy Pilot #4 RSE

START Q1 2022 — Q4 2024 | 8.4 M€ | Public funded | INCO

Project name / acronym

RdS - Sustainable Mobility and interaction with the energy system

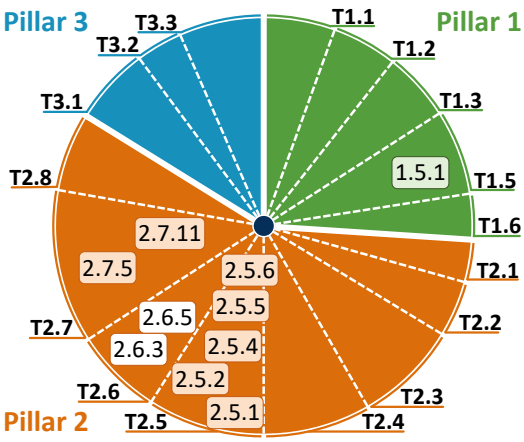
Project short description

This research project financed by the National Fund for Electric System Research (RdS) scheme has a duration of 3 years and covers many aspects of sustainable mobility and e-mobility. It includes activities on environmental and transport modelling, aimed at identifying the most effective solutions to enhance sustainability in the transport sector. Traffic models, air quality models and Life Cycle Assessment studies are developed within the project. A deep focus on e-mobility is also present, with both technical and strategic analyses on the most promising solutions for the correct interaction between electric vehicles and electric/energy system. Charging management logics and solutions to enable flexibility services through electric vehicles are provided. Besides, techno-economic analyses on the electrification of different means of transport (e.g. ships, heavy-duty vehicles, cleaning vehicles) are carried out. The project works in close interaction with universities, industrial partners and public companies.

Main involved partners

Gestione Governativa Navigazione Laghi, Scame, Becharge, FIMER, Enel X Way, Universities of: Pisa, Milan, Genoa, Naples, Benevento

Innovation Priorities addressed



See in Appendix I the full list of IPs

Italy Pilot #5

START Q1 2022 — Q1 2024 | 7.6 M€ | Public funded | INCO

Project name / acronym

RdS - Cyber Security of Energy Systems

Project short description

The integrated project on the cybersecurity of energy systems involves the three Italian research institutions, RSE, ENEA and CNR (and their associated universities and research entities) in achieving the strategic objective "Grid digitization and evolution" of the Research Program Agreement 2022-2024.

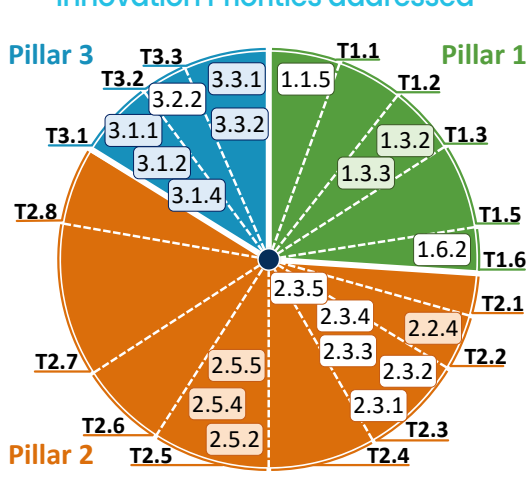
The project activities are aimed at experimenting mature cybersecurity technologies in significant application cases for the energy transition and at evaluating innovative technologies and platforms.

The objective of the experimental track is to provide the stakeholders involved in the digitalization process with tools and assessments that facilitate the adoption of cybersecurity measures in energy control devices and infrastructures. The developments relating to the innovative technologies will make it possible to drive the solutions engineering according to their effective capability to improve the cybersecurity level of energy applications, also in relation to the evolution of the cyber threat landscape.

Main involved partners

ENEA, CNR, Ugo Bordoni Foundation, University of Piemonte Orientale

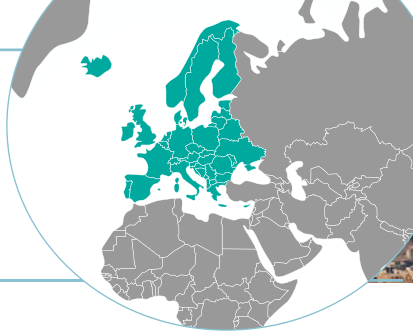
Innovation Priorities addressed



See in Appendix I the full list of IPs

CO-LEAD

ITALY



Italy Pilot #6 CNR

START Q1 2022 — Q4 2024

16.59 M€ | Public funded

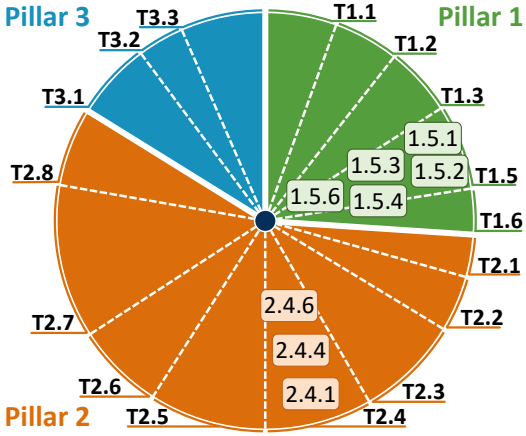
Project name / acronym
RdS - Electrochemical and thermal storage

Project short description
The integrated project "Electrochemical and thermal storage technologies" involves CNR, ENEA and RSE in the three-year plan PT 22-24 for the achievement of one of the two general objectives of the new Program Agreement (AdP): the decarbonisation by 2050. The approach is aimed at the technological development of storage systems along the entire value chain, embracing the various sectors or constituent segments.
The aim is to direct the efforts of the three research entities in a massive and timely manner, with a multidisciplinary, multi-sectoral and multi-objective approach, capable of exploring the most promising storage technologies and systems in terms of technologies, sizes, chemicals, processes and applications, with a view to environmental, economic and social sustainability.
Particular attention is paid towards less expensive and more sustainable active materials for energy storage including both mature and frontier technologies, with a view to developing the sustainable battery of the future.

Main involved partners
CNR (IT), ENEA (IT), RSE (IT)

Web link
https://www.csea.it/ricerca-di-sistema/

Innovation Priorities addressed



See in Appendix I the full list of IPs

Italy Pilot #7 CNR

START Q1 2022 — Q4 2024

2.69 M€ | Public funded

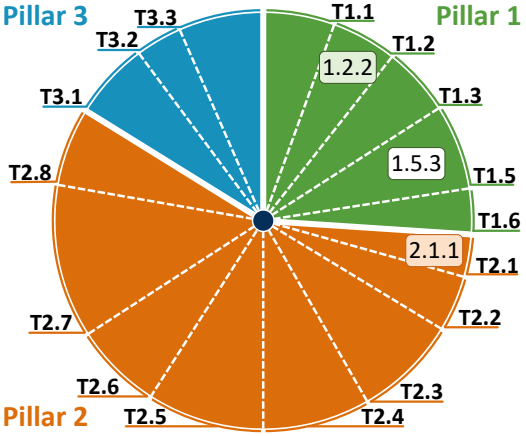
Project name / acronym
RdS - Sea renewable energies

Project short description
The concept of floating Energy Archipelago (AEg) is an original idea developed within CNR for an eco-sustainable use of the marine space, aimed at the production of renewable energy from the sea, its storage through the conversion into liquid energy (methanol, desalinated water and hydrogen) and then its use directly at sea, through both the development of hubs for refueling the ships of the future (powered by hydrogen) and aquaculture plants for fish farming.
The possibility of extending the applicability of wind and solar photovoltaics in the marine environment was the core of the previous research project and constitutes the foundations of the new project which is focused on new technologies and new challenges in the field of floating wind power and floating solar photovoltaic.
This will be achieved thanks to the availability of the first laboratory at sea for marine renewable energies (MaRELab), previously built, where the first existing prototype in the Mediterranean Sea for floating wind power was installed.

Main involved partners
CNR, UNICA, UR3-DING, UR1-DIMA

Web link
https://www.csea.it/ricerca-di-sistema/

Innovation Priorities addressed



See in Appendix I the full list of IPs

Italy Pilot #8 CNR

START Q1 2022 — Q4 2024

16.95 M€ | Public funded

Project name / acronym

RdS - High-efficiency photovoltaic

Project short description

The project envisages the development of materials, solar cell architectures and manufacturing processes that allow for the production of high-efficiency photovoltaic cells. Materials and processes that can improve the current performance of silicon heterojunction solar cells will be studied. Thin-film perovskite solar cells will be developed considering scalability, eco-sustainable manufacturing processes and/or the possibility of depositing materials in less controlled environments than the Glove Boxes. Perovskite cells will also be used to realize tandem cells in combination with silicon (perovskite/silicon) or with CIGS thin films (perovskite/CIGS).
Studies on other semiconductor materials, such as III-V compound materials and nitride thin films (Zn-IV-N2), to be used in the frontal component of a tandem cell coupled with silicon will also be carried out. PV/Concentrating PV hybrid modules, equipped with an integrated solar tracking system, to be used in sites that do not have high amounts of annual direct solar radiation, will be developed.

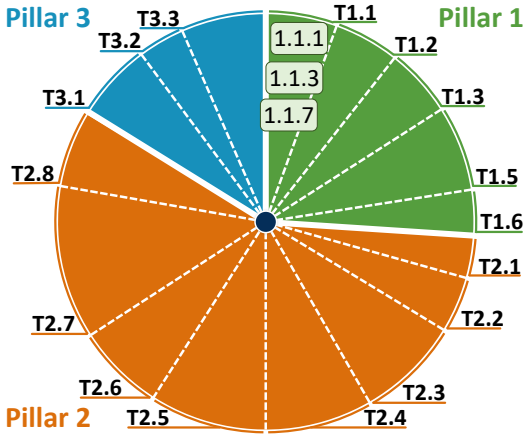
Main involved partners

ENEA (IT), CNR (IT), RSE (IT)

Web link

https://www.csea.it/ricerca-di-sistema/

Innovation Priorities addressed



See in Appendix I the full list of IPs

Italy Pilot #9

START Q3 2024 — 2026

20 M€ | Co-funded | INCO

Project name / acronym

Geographical islands, off-grid systems and energy communities

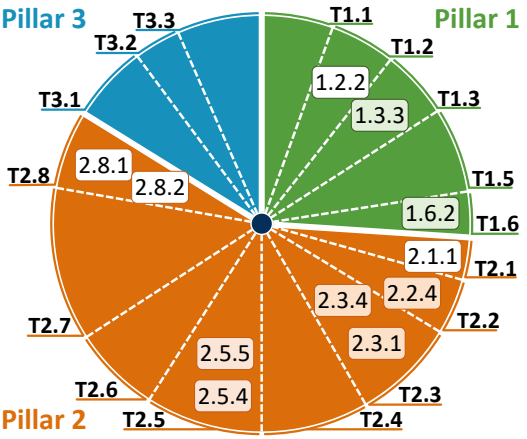
Project short description

Pilot project addressing off-grid or isolated systems including research and innovation on off-shore energy production and storage, as well as on energy communities as a way to foster the use of locally available RES resources and the management of local flexibility. This pilot project will address the implementation of optimized solutions for distributed renewable energy production, consumption and storage integration as well for the optimal management of EVs charging (smart charging/V2X). The proposed solutions consider the peculiarities of the territories (such as islands or mountain areas), the seasonality of energy demand, and the environmental impact, in order to minimise permitting times, as well as aspects of replicability and scalability of the solutions proposed and validated in the project. It will also demonstrate that the proposed solutions lead to a reduction in emissions and fossil fuel consumption. Flexibility solutions of practical implementation to exploit opportunities related to the nexus between water and energy systems, water management and desalination plants are considered.

Main involved partners

To be defined

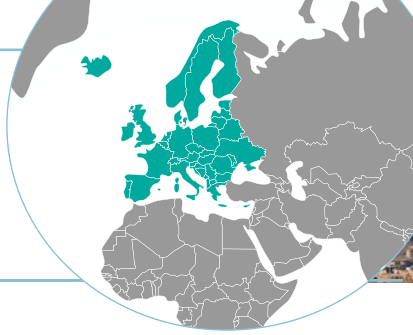
Innovation Priorities addressed



See in Appendix I the full list of IPs

CO-LEAD

ITALY



Italy Pilot #10

START Q3 2024 → 2026

20 M€ Co-funded | INCO

Project name / acronym

Integrated urban system flexibility

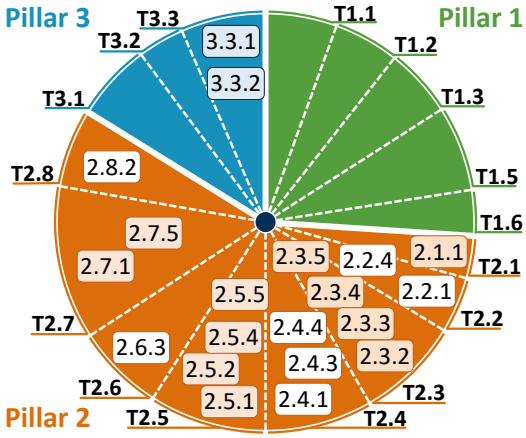
Project short description

Pilot project for an integrated urban system flexibility, to be developed in an urban environment and hence involving a neighborhood, a small town or a large city.
This pilot project will consider demand side management, electric vehicles integration, aggregators, distributed energy resources management and distributed electrochemical storage.
By means of the installation or the exploitation of advanced sensors and a strong system digitalisation, for example by creating a network 'digital twin', the project will deploy advanced automation and monitoring solutions for medium and low voltage networks in urban environments.
Innovative solutions such as increased DERs hosting capacity, support to the electrification of end uses, and management as well as the easing of the deployment of flexibility markets are considered.

Main involved partners

To be defined

Innovation Priorities addressed



See in Appendix I the full list of IPs

Italy Pilot #11

START Q3 2024 → 2026

20 M€ Co-funded | INCO

Project name / acronym

Industrial districts demand side flexibility

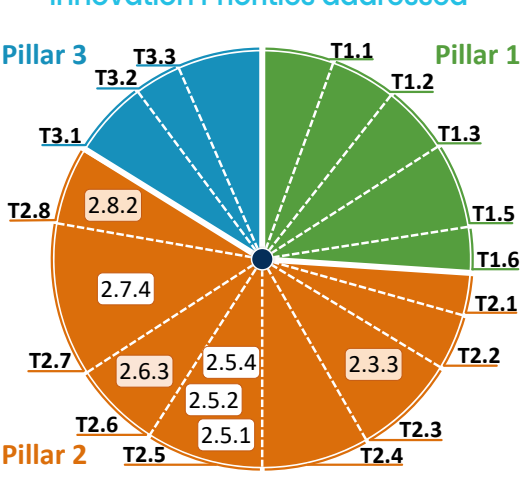
Project short description

Pilot project considering demonstration of innovative solutions to leverage the flexibility of industrial and commercial processes and loads, specifically on a MW-scale level such as industrial loads, shopping centers, etc.
This pilot project will address solutions suitable for large industrial loads that take into account the challenges related to the feasibility of business model, which are heavily affected by technical and economic barriers in modifying highly optimized industrial processes.
Flexibility solutions of practical implementation for the decarbonisation of industrial processes and management activities of large hospital or commercial centres are considered.
By successfully demonstrating the feasibility and benefits of flexibility solutions in these contexts, the project can serve as model for other industries and facilities, promoting widespread adoption of sustainable practices.

Main involved partners

To be defined

Innovation Priorities addressed



See in Appendix I the full list of IPs

Italy Pilot #12

START Q3 2024 — 2026

20 M€ Co-funded | INCO

Project name / acronym

Enhanced system operation and innovative flexibility services

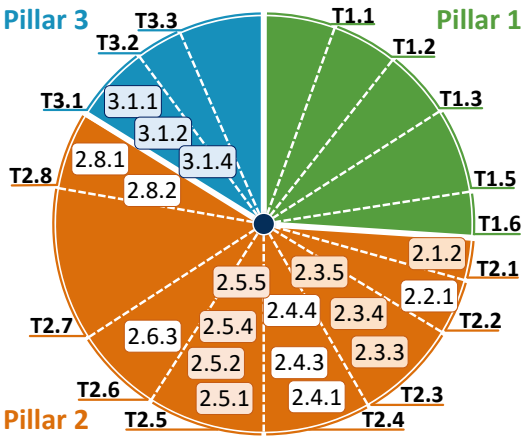
Project short description

Pilot project addressing the modernization of existing network assets and operational procedures, also considering TSO-DSO coordination. This pilot project will address the integration of flexibility resources providing enhanced grid ancillary services, focusing on flexible generation, storage and integration of different energy sectors (sector coupling); for example, this pilot project will consider solutions for demand response, pumped and run-of-river hydro, utility scale batteries, power to X applications, etc. Flexibility solutions concerning the exploitation of demand response to alleviate network congestion and improve service continuity in short term operation and at the same time allow system operators to perform net savings in long-term planning by optimizing investments, reducing losses, and increasing grid security and flexibility are considered. The added value of this pilot project also lies in proposing implementable solutions for (i) system planning of the future decarbonised energy system at the lowest possible cost, including through investment optimisation and long-term planning, (ii) enhanced observability and controllability of the system, through increasing digitization, (iii) stability and security in future low-inertia power electronics dominated electrical system, and (iv) uncertainty and resilience management, especially to face climate change.

Main involved partners

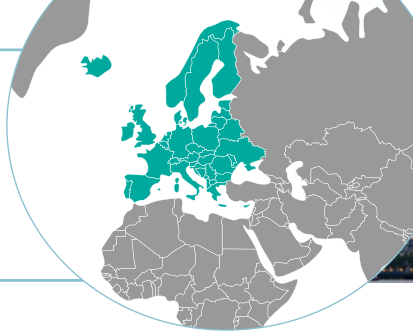
To be defined

Innovation Priorities addressed



See in Appendix I the full list of IPs

CO-LEAD



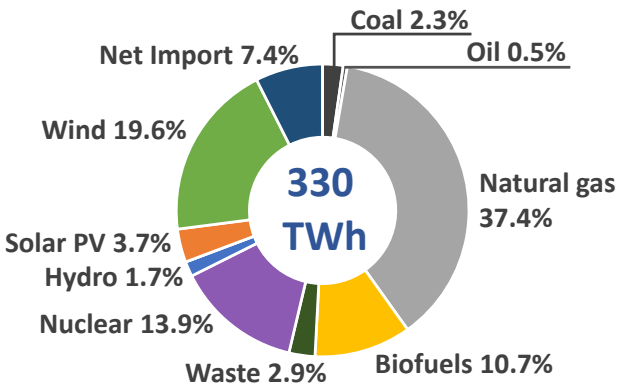
UNITED KINGDOM

Decarbonisation targets

The UK has committed to reaching net zero emissions by 2050 and has set a target to decarbonise the power system by 2035. As part of this, the UK's goal is to develop up to 50GW of offshore wind by 2030 and to quintuple solar power by 2035.

Main innovation activities

The UK's Net Zero Research and Innovation Framework and Delivery Plan 2022 to 2025 set out the portfolio of net zero research and innovation programmes the UK is delivering towards its net zero target. The UK Government will invest over £4 billion from 2022 to 2025 (with further investment from Ofgem) to help develop the next generation of technologies and solutions needed to deliver the UK's net zero target.
This includes funding specifically allocated to net zero innovation, as well as net zero research, and investments in innovation relating to energy networks. It also includes the £1 bn Net Zero Innovation Portfolio (NZIP), which is providing funding for low-carbon technologies and systems across ten priority areas. The NZIP is accelerating low-carbon technologies, systems and business models in power, buildings, and industry, decreasing the costs of decarbonisation, and helping to enable the UK to end its contribution to climate change.



Electricity generation mix and net import (IEA data 2021)

UK Pilot #1

Project name / acronym

Flexibility Innovation Programme

Project short description

This national pilot programme looks to support innovative solutions to enable widespread electricity system flexibility. It is funding innovation across a range of smart energy applications across the themes of integrating systems for flexibility, data and digitalisation and markets for flexibility. It includes trial and demonstration activity varying in scale across these themes including pilot activity on automatic asset registration, interoperable demand side response, vehicle-to-everything, smart energy data repository, and alternative energy markets for domestic demand side response. This pilot activity is particularly relevant to the Mission Innovation Pillars of System Flexibility and Market Design, and Data and Digitalisation for System Integration; and is demonstrating action against Mission Innovation Priorities including system stability and flexible operation, demand-side and EV flexibility, markets, business models and regulatory framework and standards for interoperability. After launching in October 2021, much of the pilot activity has gone through initial feasibility stages and is now in development and delivery. During design phase the programme conducted extensive stakeholder engagement, engaging over 1000 participants in the scoping of innovation activity. Moving into delivery the programme is currently supporting over 40 projects and over 100 organisations to conduct innovation to drive forward and enable the delivery of a smart and flexible energy system. The Flexibility Innovation Programme is part of the UK's Net Zero Innovation Portfolio.

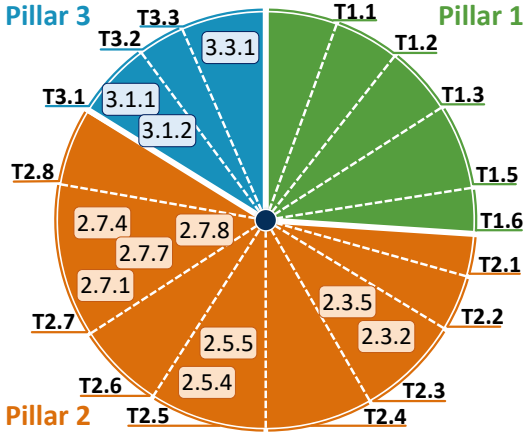
Main involved partners

Numerous partners across industry

Web link

https://www.gov.uk/government/publications/flexibility-innovation

Innovation Priorities addressed



See in Appendix I the full list of IPs

UK Pilot #2

START Q1 2022 — Q1 2025

up to 80 M€ | Public funded

Project name / acronym

LODES - Longer Duration Energy Storage

Project short description

This national pilot programme looks to support innovative solutions in energy storage technologies to accelerate commercialisation of innovative longer duration energy storage projects. It is funding innovation across storage types of electricity, thermal and power to X, focussing on progressing projects towards TRL 6 or TRL 9. This includes pilots of these energy storage technologies, both in terms of prototypes in operational environments and demonstrations in operational environments. This pilot activity is particularly relevant to the Mission's Innovation Pillars of Affordable and Reliable VRE and System Flexibility and Market Design; and is demonstrating action against Mission Innovation Priorities including energy storage supply chain, recycle and reuse and energy storage integration. After launching in February 2022, much of the pilot activity has gone through initial feasibility stages and is now in development and delivery. During design phase the programme conducted extensive stakeholder engagement and moving into delivery the programme includes over 30 projects and over 75 organisations conducting innovation to drive forward and enable the delivery of a smart and flexible energy system. The Longer Duration Energy Storage Programme is part of the UK's Net Zero Innovation Portfolio.

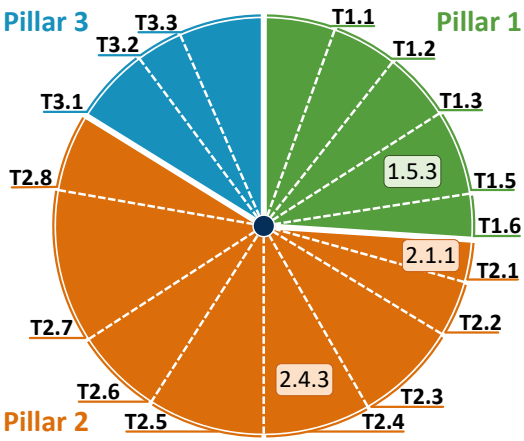
Main involved partners

Numerous partners across industry

Web link

https://www.gov.uk/government/publications/longer-duration-energy-storage-demonstration

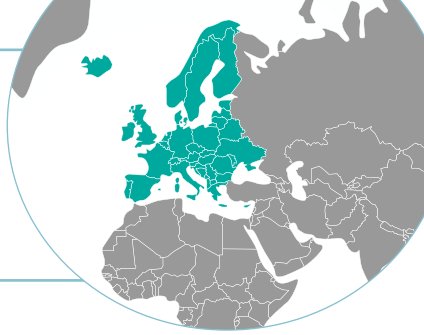
Innovation Priorities addressed



See in Appendix I the full list of IPs

SUPPORT MEMBER

AUSTRIA



Decarbonisation targets

In 2020, the Austrian government has committed itself to reach climate neutrality by 2040. Energy research and technology development are key elements of this roadmap. Already by 2030, Austria pursues ambitious goals including:

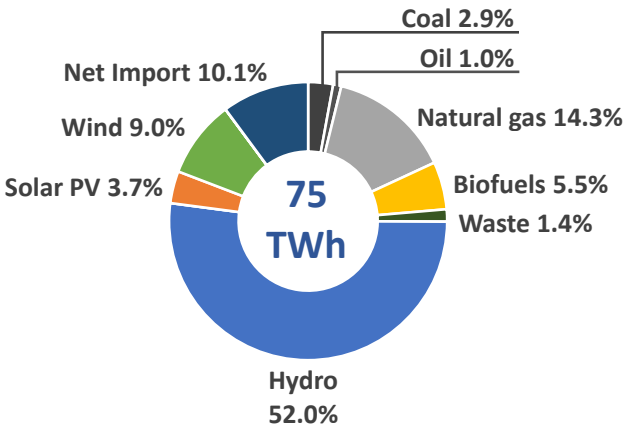
- reduction of CO_2 emissions by 36% compared to 2005
- providing 100% of its total electricity consumption (national balance) from renewable energy sources
- increase in the share of renewable energy in the gross final energy demand to 45-50%

Main innovation activities

To reach above mentioned goals, in 2023 a strategy process on defining research and innovation priorities and programs for the period 2024 to 2026 is ongoing.
It will include four strategic pillars:

- Energy transition (including power system transition)
- Mobility transition
- Climate resilient cities
- Circular economy

Around these strategic pillars the government is going to provide dedicated research and innovation funding programs for the upcoming three years.



Electricity generation mix and net import (IEA data 2021)

Austria Pilot #1

Project name / acronym

Green Energy Lab

Project short description

Green Energy Lab is a research initiative for sustainable energy solutions, as part of the Austrian innovation campaign "Vorzeigeregion Energie" ("Flagship region Energy") of the Climate and Energy Fund. It has been launched in 2018. So far 37 individual projects have been started within the initiative, whereof 20 are active in 2023 and regular calls for new projects are published. The decision on projects to be newly launched in 2023 is still pending, when publishing this report.
Green Energy Lab is Austria's largest innovation laboratory for green energy and it includes activities related to digitalization, flexibility, integrated energy systems (including hydrogen and district heating), customer integration and business models.
It comprises the test markets Vienna, Lower Austria, Burgenland, and Styria.
By 2025, Green Energy Lab will have invested 150 million euros in innovative projects.

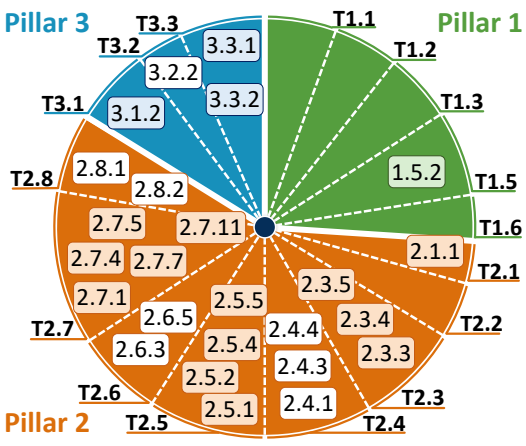
Main involved partners

More than 300 partners from research, industry, and the public sector join the energy suppliers of these four Austrian provinces, namely "Wien Energie" in Vienna, "EVN" in Lower Austria, "Burgenland Energie" in Burgenland, and "Energie Steiermark" in Styria, in order to develop customer- and demand-oriented, scalable solutions all the way from prototypes to marketability.

Web link

https://greenenergylab.at/en/

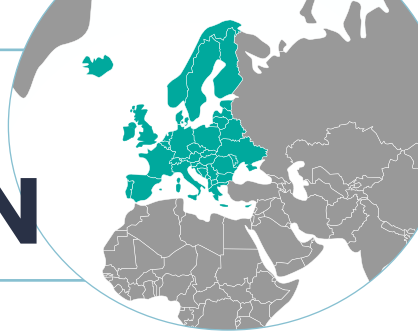
Innovation Priorities addressed



See in Appendix I the full list of IPs

SUPPORT MEMBER

EUROPEAN UNION



Decarbonisation targets

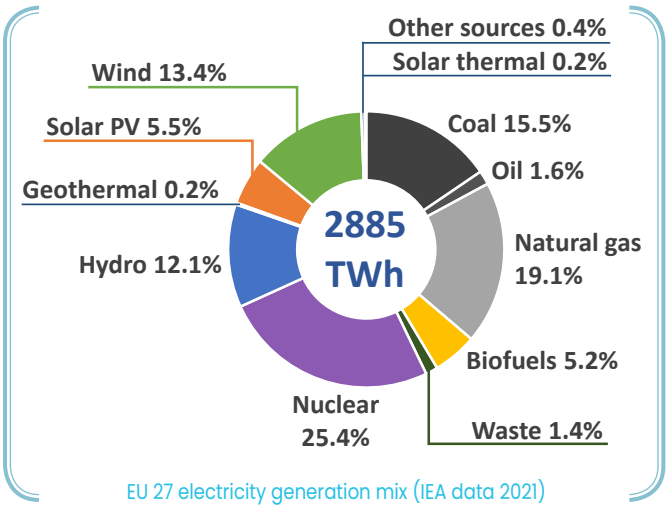
The EU aims to be climate-neutral by 2050 – an economy with net-zero greenhouse gas emissions. This objective is at the heart of the European Green Deal and in line with the EU's commitment to global climate action under the Paris Agreement. The 'fit for 55' package, presented in July and December 2021, is designed to realise the European Climate Law objectives: climate neutrality by 2050 and a 55% reduction of net greenhouse gas (GHG) emissions by 2030, compared with 1990 levels. It consists of 13 interlinked proposals to revise existing EU climate and energy laws, and six proposals for new legislation. The proposals aim to accelerate emission reductions in the sectors covered by the EU emissions trading system (ETS) and the sectors covered by the Effort-sharing Regulation, and to increase carbon removals in the land use, land-use change and forestry (LULUCF) sector.

Main innovation activities

Horizon Europe is the European Union's research and innovation framework program for the period of 2021-2027. Its main goal is to drive scientific and technological advancements to address societal challenges, including decarbonization and the transition to a sustainable and low-carbon economy.

1. Clean Energy Technologies: Horizon Europe promotes the development and deployment of clean energy technologies, including renewable energy sources such as solar and wind. The program aims to support research and innovation in improving the efficiency, affordability, and scalability of clean energy solutions.
2. Energy Storage and Grid Integration: Horizon Europe focuses on advancing energy storage technologies to enable the integration of variable renewable energy sources into the electricity grid. Research activities include the development of advanced battery technologies, grid management systems, and smart grid solutions to optimize energy distribution and consumption.
3. Carbon Capture, Utilization, and Storage (CCUS): Horizon Europe supports research and innovation efforts to develop CCUS technologies that can capture and store carbon dioxide emissions from industrial processes and power generation.
4. Sustainable Mobility: The program emphasizes the development of sustainable transportation solutions to decarbonize the mobility sector. This includes research and innovation in electric vehicles, alternative fuels, intelligent transport systems, etc.
5. Energy Efficiency and Buildings: Research activities focus on developing energy-efficient building envelopes, smart energy management systems, and sustainable heating, ventilation, and air conditioning (HVAC) solutions.
6. Circular Economy and Resource Efficiency: This involves developing innovative technologies for waste management, recycling, and resource recovery to minimize waste generation and maximize the use of renewable resources.
7. Cross-Sectoral Innovation: Horizon Europe encourages collaboration across different sectors and disciplines to foster innovation for decarbonization. This includes initiatives that integrate research and innovation from areas such as information and communication technologies (ICT), materials science, social sciences, and behavioral studies to drive systemic changes for sustainability.

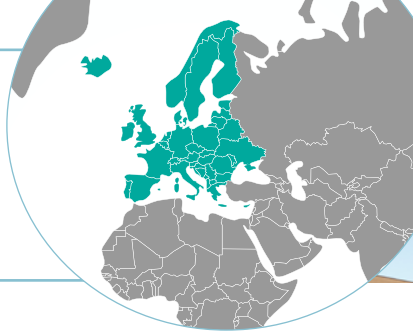
These activities provide a broad overview of the innovation initiatives under Horizon Europe for decarbonization.



EU 27 electricity generation mix (IEA data 2021)

SUPPORT MEMBER

GERMANY

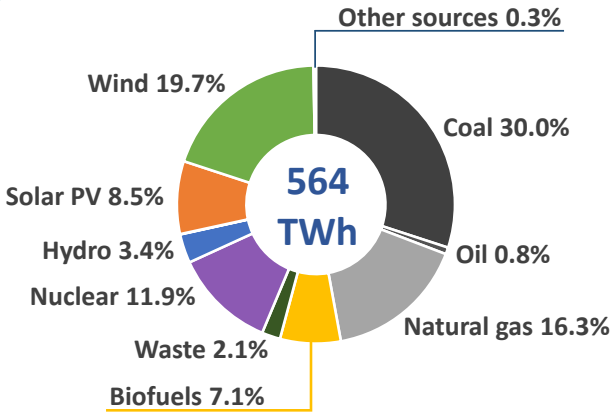


Decarbonisation targets

Germany is legally obliged to be carbon neutral by 2045. By 2030, emissions are to be reduced by 65 % compared to 1990. Six different economic sectors (Energy, Industry, Buildings, Waste, Transport and Agriculture) have binding emission targets for the years up to 2030. The emission limits have been further reduced compared to previous targets, and the biggest reductions are required from the energy and industry sectors. The climate targets will be kept under review through monitoring by a council of climate experts.

Main innovation activities

Priority innovation activities are derived from the climate objectives. The revised energy research policy will focus on specific missions that will support the implementation of the climate goals through research, development and implementation (RD&I) actions with appropriate funding instruments. Particular emphasis will be given to the missions on heat transition, power transition, hydrogen and the holistic energy system. In addition, other missions on cross-cutting issues will support the increased efforts. The missions also follow the integrated and cross-sectoral approach of the RD&I actions link in Mission Innovation.



Electricity generation mix (IEA data 2021)

Germany Pilot #1

Project name / acronym

AI-flex

Project short description

The cellular approach addresses decentralized, self-governed energy cells on all hierarchical grid levels. Every cell can encompass electric, gas and district heating grids achieving high efficiency and flexibility due to sector coupling and energy storage solutions such as batteries and Power-to-X systems. Compared to conventional grid operation, each cell optimizes its renewable power generation, energy consumption and stored energy on a much finer granularity level and a much higher level of complexity of the optimisation due to a high number of participants. In the scope of the AI-flex project, an autonomous AI-based cell optimizer will be developed for the efficient energy and flexibilities management of a multitude of energy storage devices from the perspective of an energy cell. The AI-based control is integrated and demonstrated under real-world conditions by means of a digital twin of the energy system serving as a coherent information and interaction layer for all market participants.

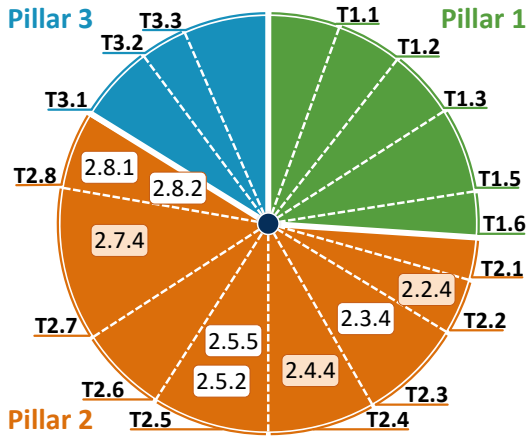
Main involved partners

Hochschule Bielefeld (DE), Stadtwerke Bielefeld GmbH (DE), RPTU Kaiserslautern (DE), Voltaris GmbH (DE), TU Wien (AT), AIT Austrian Institute of Technology (AT)

Web link

https://www.linkedin.com/showcase/ai-flex-fh-ites-agnes

Innovation Priorities addressed



See in Appendix I the full list of IPs

Germany Pilot #2

START Q2 2022 — Q4 2024

2.8 M€ Co-funded | INCO

Project name / acronym

DIEGO

Project short description

The aim of the DIEGO project is to develop digital tools for sustainable energy systems in an international consortium. The planned solutions of digital tools and methods for planning, development and operation of sustainable energy systems and processes will sustainably promote society and identify possible new market models. The different expectations of customers and users will be analysed in order to incorporate them into the project solutions and to meet their specificities and needs. Equality and inclusion of end-users in the energy system and market are essential for the successful transition and decarbonisation of energy infrastructures. The main objective of DIEGO is to develop and test consistent methods and applications for digital integrated system and component networking of processes and infrastructures to provide reliable, cross grid and sustainable industrial products. Hence, DIEGO solutions will be developed and validated on five different demonstrators at five different locations.

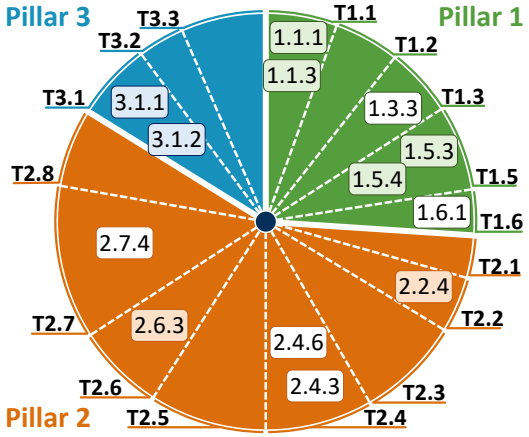
Main involved partners

Hochschule Magdeburg-Stendal (DE), LS Software & Engineering GmbH (DE), Energie Mittelsachsen GmbH (DE), Electrum Ltd (PL), Warsaw University of Technology (PL), Energie Kompass GmbH (AT), meo ENERGY GmbH (AT), Salzburg Research Forschungsgesellschaft mbH (AT), Ben-Gurion University of the Negev (IL)

Web link

https://www.linkedin.com/company/diego-digital-solutions/

Innovation Priorities addressed



See in Appendix I the full list of IPs

Germany Pilot #3

START Q2 2022 — Q2 2025

2 M€ Co-funded | INCO

Project name / acronym

DigIPlat

Project short description

The energy transition is leading to greater decentralisation, sector coupling and digitalisation, with scalable digital flexibility platforms playing an important role. A certain degree of interoperability of these platforms at national and international level, as well as standardisation, is crucial for security of supply and for promoting economically efficient and coordinated flexibility allocation. The aim of DigIPlat is to develop new digital solutions for the interoperability of flexibility platforms based on various ICT, economic or procedural measures. To derive these solutions, a unique use case of cross-border and cross-platform coordination of flexibility for redispatch, balancing and intraday markets will be analysed and tested. The digital solutions will be applied in a field test for technical evaluation. Possible welfare benefits of platform interoperability and standardisation will be measured using market and network simulations.

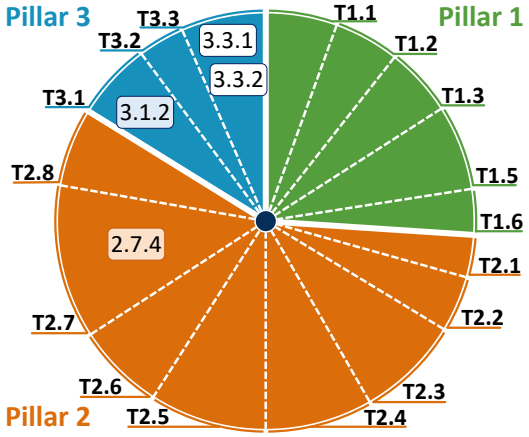
Main involved partners

Technische Hochschule Ulm (DE), TransnetBW GmbH (DE), Fichtner IT Consulting GmbH (DE), Karlsruher Institut für Technologie KIT (DE), AIT Austrian Institute of Technology (AT), Austrian Power Grid AG (AT), Institut für Operations Research and Computational Finance der Universität St. Gallen – HSG (CH)

Web link

https://www.digiplat.eu

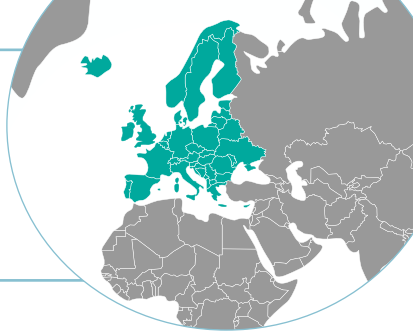
Innovation Priorities addressed



See in Appendix I the full list of IPs

SUPPORT MEMBER

GERMANY



Germany Pilot #4

START Q2 2022 — Q2 2025

2.8 M€ Co-funded | INCO

Project name / acronym

AISOP

Project short description

The current energy transition is having a significant impact on the operation of distribution networks, creating new operational requirements for the Distribution System Operator (DSO). In combination, decarbonisation and digitalisation create opportunities for the DSO to adopt new tools and processes, but also important responsibilities in terms of data protection and cyber security. In this context, AISOP supports DSOs in their challenges through an AI-based decision support system.

The decision support system securely and privately collects, processes, interprets and uses data for advanced digital technology - for the benefit of DSO operational planning. The primary use case is to support the DSO's situational awareness of the distribution network, focusing on network condition analysis, fault prediction, identification of anomalies and unexpected consumption patterns. Combined with risk analysis, AISOP is then able to support the DSO's operational planning through ML-based dynamic tariff setting and security constrained grid management.

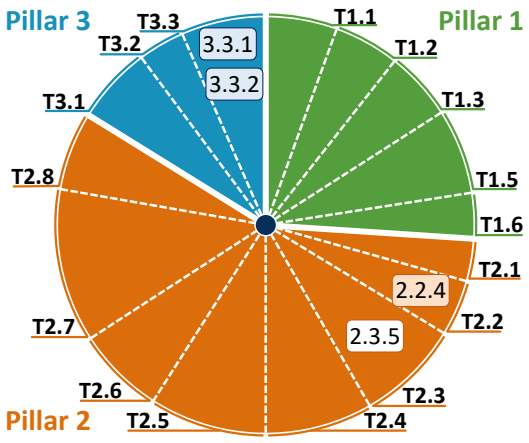
Main involved partners

Hochschule Luzern (CH), ETH Zürich (CH), Zedo (DE), logarithmo GmbH & Co. KG (DE), Westfalen Weser Netz GmbH (DE), ASEW (DE), Hive Power (CH), Romande Energie (CH)

Web link

https://aisopproject.com/

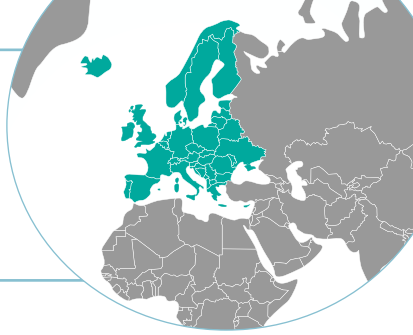
Innovation Priorities addressed



See in Appendix I the full list of IPs

CORE MEMBER

SPAIN



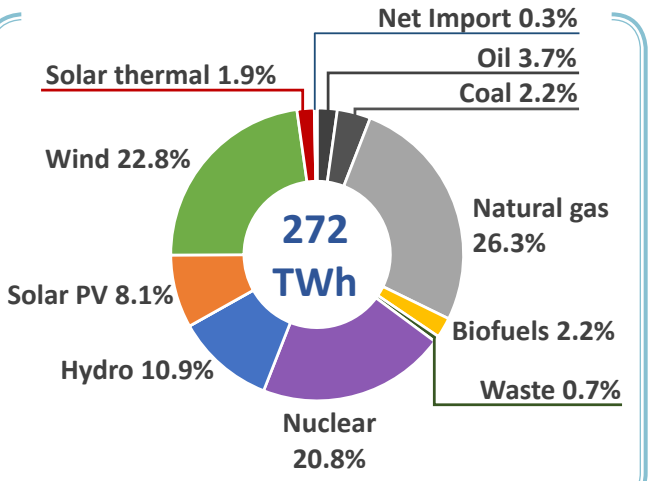
Decarbonisation targets

Spain's long-term objective is to achieve carbon neutrality before 2050 as established in the Law on Climate Change and Energy Transition. The Law encompasses key planning instruments such as the National Energy and Climate Plan 2021-2030 (NECP) and the Long Term Strategy 2050, which paves the way towards RIC objectives.
The NECP includes policies and measures aiming at mitigate one in three tons of greenhouse gas emissions by 2030, reflecting an elevated level of ambition that overcomes the objectives of the European Union and the Paris Agreement.

Main innovation activities

The achievement of energy and climate-related research, development and competitiveness objectives will be pursued by means of several activities. Those include the Strategic Project for the Recovery and Economic Transformation of Renewable Energies, Renewable Hydrogen and Storage (PERTE EHRA), that comprises specific aid programs to promote innovation in these sectors, as well as all the measures contemplated in the NECP RIC Dimension. Additionally, regulatory sandboxes are planned in the Law on Electric Sector to promote research and regulatory innovation in the sector.

Please notice that the fiches from Pilot #13 till Pilot #22 reported in this section refer to relevant European projects as selected by Spain.



Electricity generation mix and net import (IEA data 2021)

Spain Pilot #1

Project name / acronym

Data-driven operation of distribution networks to unlock flexibility services / FlexOnGrid

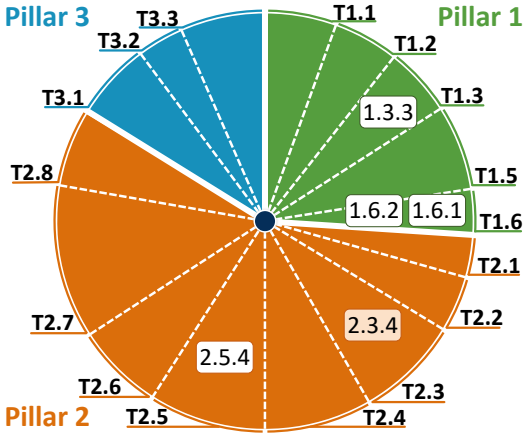
Project short description

FlexOnGrid project focuses on improving the operation of distribution networks by using flexibility services offered by third parties. It is well proven the benefits flexibility services bring to the system, but numerous technical challenges remain to be solved: huge volume of data collected by smart meters but low level of monitoring in real-time, lack of a detailed network model, low level of communication between stakeholders, unbalanced nature of distribution grids, etc.
FlexonGrid addresses these challenges by focusing on: experimentally demonstrate that data-driven techniques can provide distribution networks with the desired flexibility to increase their efficiency and achieve higher levels of DERs penetration; working in solutions around distributed control and even in autonomous local control enriched with partial network information provided by DSO; work with the full distribution network will be used to test and validate new model-free solutions that solve many of the real problems of distribution networks to certainly integrate renewable sources.

Main involved partners

University of Sevilla (ES)

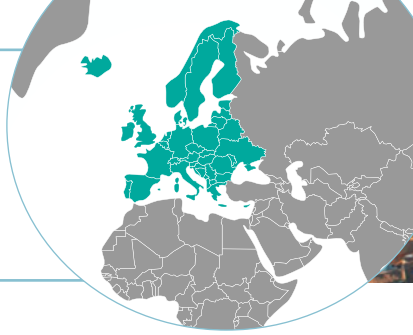
Innovation Priorities addressed



See in Appendix I the full list of IPs

CORE MEMBER

SPAIN



Spain Pilot #2

START Q3 2022 — Q3 2026

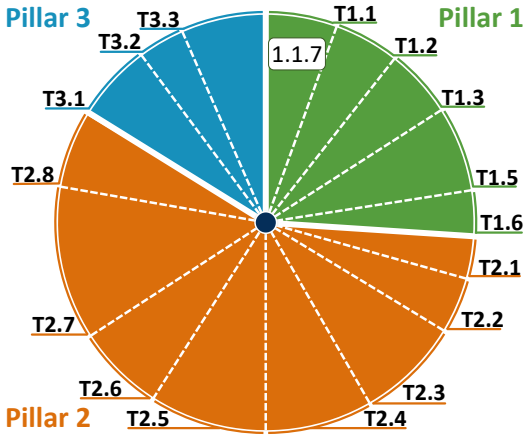
500k€ | Public funded

Project name / acronym
AGRIELECTRIC

Project short description
The main objective of AGRIELECTRIC is the investigation and analysis of the critical points of the systems and components for the design of agrivoltaic functional units that allow maximizing both the productive potential of crops and the generation of electrical energy from photovoltaic panels, as well as the development of tools that assist in the processes of design, sizing, optimization and operation of agrivoltaic systems in certain locations depending on the conditions of the edaphoclimatic and geomorphological environment. The main task will be the implementation of one of the first agrivoltaic experimental units in Europe focused on high-value food crops, in rotation.
The AGRIELECTRIC project has a clear industrial research orientation, with an effective collaboration between a research companies for renewable energy systems, new photovoltaic technologies and agronomic management in Cfb-Oceanic agro-climatic areas with irrigation availability.

Main involved partners
NEIKER (ES), TECNALIA (ES), Universidad del País Vasco (ES)

Innovation Priorities addressed



See in Appendix I the full list of IPs

Spain Pilot #3

START Q4 2021 — Q4 2023

500k€ | Public funded

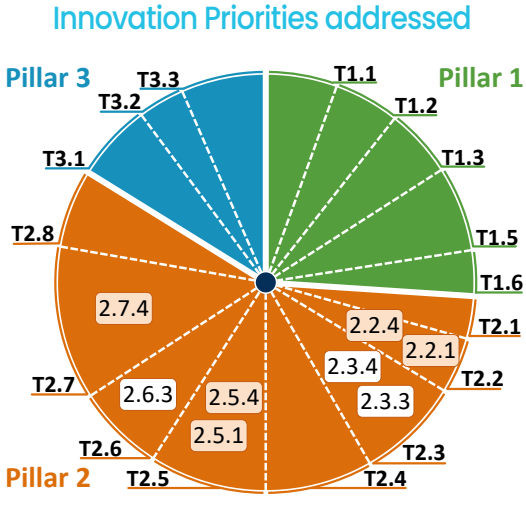
Project name / acronym
LV Digital Twins for flexibility activation / DT4Flex

Project short description
DT4Flex project consists of the research, development and testing of a novel tool, a digital twin of the physical LV network, thought to be used by distribution companies. This is capable of detecting near future incidents using DSSE and managing the flexibility in the operation of the distributed resources connected to the Low Voltage networks in an optimized way. DT4Flex aims to help grids evolve to the next level of smart grids by: guaranteeing electricity supply of distribution networks, optimizing the energy efficiency and asset operation and developing tools to put the customer in the centre of this transition. Given the importance of this, work has been done on the development of new solutions that allow the DSO (Distribution System Operator) to identify its flexibility needs and quantify the optimal flexibility service that solves them. All validation tests have been carried out in a demonstrator simulated using data from Cuerva Living Lab.

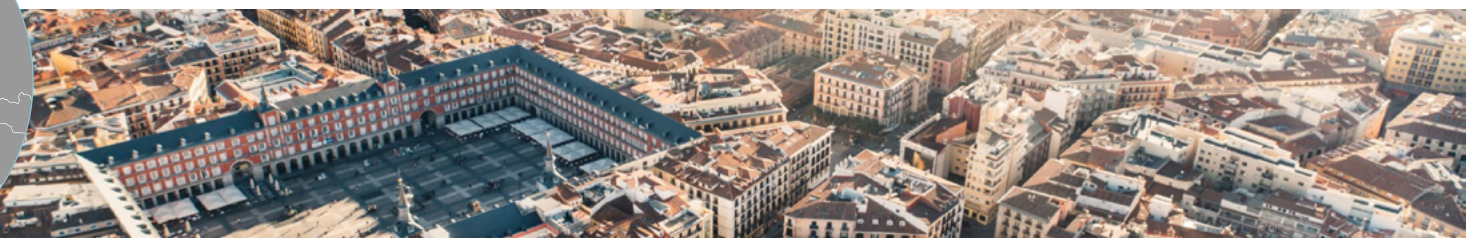
Main involved partners
Ingelectus (ES), Cuerva (ES), Bamboo Energy (ES)

Web link
https://ingelectus.com/dt4flex/

Innovation Priorities addressed



See in Appendix I the full list of IPs



Spain Pilot #4

START Q4 2023 — 2024

320 k€ | Private funded

Project name / acronym

SHIPAM-WT

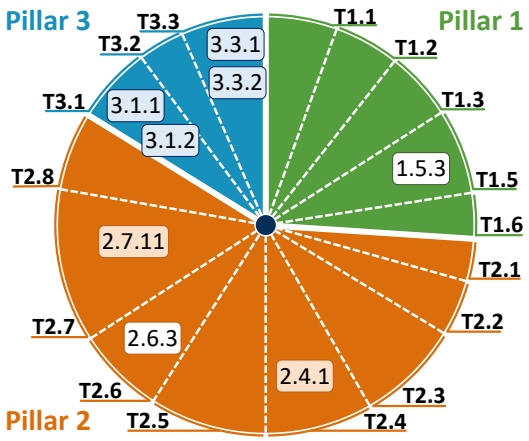
Project short description

As concentrated solar heat for industrial processes (SHIP) matures and proves competitive, its application and integration with processes traditionally not coupled with heat sources becomes apparent. Such processes include, but are not limited to, heating of evaporation ponds traditionally utilized in oil mills and salt production industry, e.g. sea salt and lithium. This initiative seeks to demonstrate the technoeconomic feasibility of coupling concentrated solar thermal collectors to corrosive environments via the implementation of advanced materials that have good thermal conductivity and corrosion resistant characteristics.
Such solutions are needed because oil mills have limited options in handling the highly toxic effluents. Trends indicate that reliance on emergency storage margins are increasing, thereby increasing the risk of contaminating grounds within their vicinity. This demonstration projects presents innovation applicable to water treatment in industries associated to the agroalimentary, batteries and blue economies.

Main involved partners

SOLEAHEAT (ES), Olivarera San Isidro de Gilena (ES), Universidad de Cádiz (ES)

Innovation Priorities addressed



See in Appendix I the full list of IPs

Spain Pilot #5

START <Q4 2024 — 2028

5.8 M€ | Co-funded

Project name / acronym

VISYNC

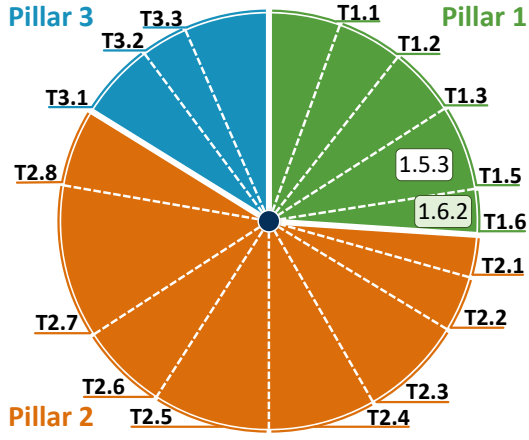
Project short description

This project aims to develop and validate at full scale a hybrid storage system that combines lithium-ion batteries and ultracapacitors managed by a specific control system that allows it to operate in synchronous grid-forming mode (InMS™ from HESStec) to provide the same services as a Synchronous Compensator. The new storage system will be connected to the high voltage transmission grid in the Lanzarote-Fuerteventura electricity system, specifically at the Mácher 66 kV substation, and will operate as an integrated grid asset, providing a wide variety of services to guarantee safe operation of the electricity system and increased integration of renewable energies. The proposed system has a capacity of 16 MW (18.8 MVA of maximum apparent power) and 3.45 MWh of energy storage capacity. This significant capacity will contribute to grid stability and support smooth integration of renewable energy sources.

Main involved partners

Red Electrica Infraestructuras En Canarias SA (ES), Red Electrica De España SA (ES), Red Electrica Y De Telecomunicaciones (ES), Innovacion Y Tecnologia SA (ES), Hybrid Energy Storage Solutions SL (ES), Certification Entity For Renewable Energies SL (ES), Cuadros eléctricos Nazarenos SL (ES), and S2 Grupo De Innovacion En Procesos Organizativos SL (ES)

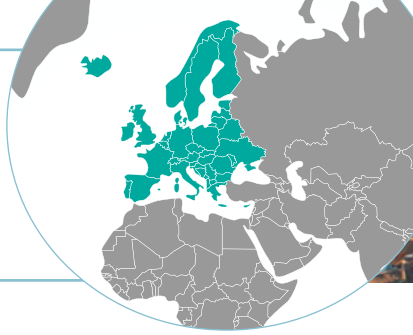
Innovation Priorities addressed



See in Appendix I the full list of IPs

CORE MEMBER

SPAIN



Spain Pilot #6

START Q4 2024 → 2028

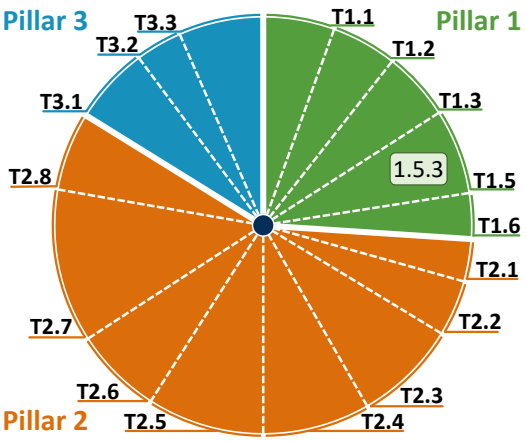
1.5 M€ | Co-funded

Project name / acronym
HY4GRID

Project short description
This project aims to implement and validate full-scale hybrid technology for 100% renewable electricity generation and storage.
Specifically, the project consists of developing and implementing storage systems based on a double hybridisation between Li-Ion batteries and ultra-capacitors and the complementary renewable generation farms themselves, which in the case of this project are: the Barasoain experimental wind farm and the Montes del Cierzo experimental photovoltaic plant, both in Navarra. Both systems will include control technology based on Grid Forming and control algorithms on the renewable resource, which will allow the storage technology to be fully coordinated with the generation and achieve a robust contribution to the grid, eliminating disturbances, loss of inertia, etc., typical of the fluctuating nature of renewable energies to provide the same services as a synchronous compensator in addition to those available for energy storage

Main involved partners
Acciona Generacion Renovable SA (ES), Hybrid Energy Storage Solutions SL (ES)

Innovation Priorities addressed



See in Appendix I the full list of IPs

Spain Pilot #7

START Q3 2022 → Q3 2026

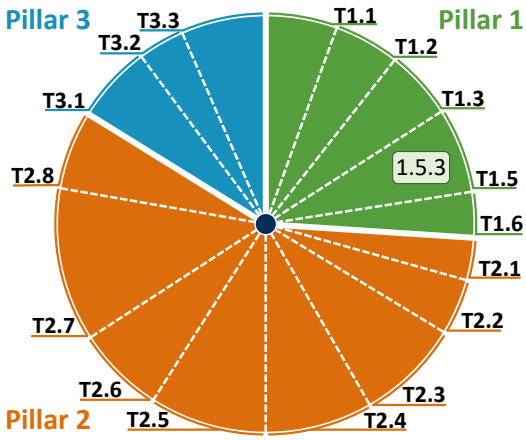
5.43 M€ | Public funded

Project name / acronym
TIRAJANA

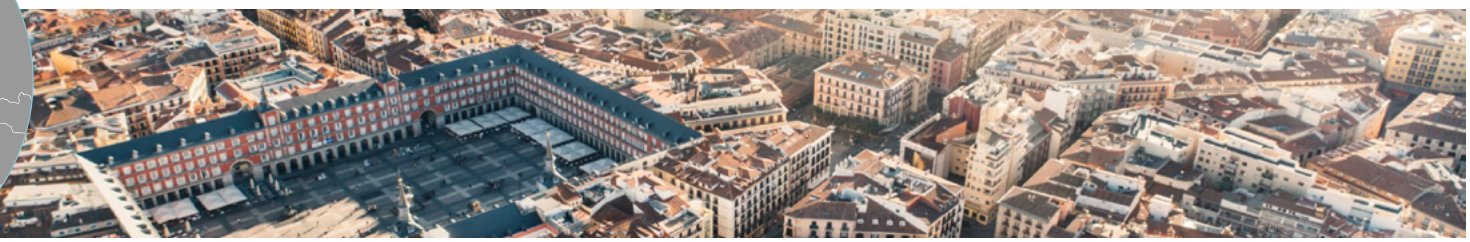
Project short description
The project "Hybridization of the Barranco de Tirajana" wind farm with an electrochemical storage system with a zinc hybrid cathode was designed to test the operation of an innovative battery system in a wind farm located on the island of Gran Canaria.
The project Tirajana will contribute to reducing the discharges from the plant due to the overcapacity of the same and maximize the injection into the network of renewable energy, contributing to the reduction of emissions and an increase in the flexibility of the system, enabling various services to the network.
In addition, the intention is to encourage the adoption and development of an innovative and alternative storage technology that represents a huge advance in environmental terms given the minimal environmental impact of the batteries, as they are fully recyclable and have a longer life span, as well as being safe.

Main involved partners
Enel Green Power España SL (ES)

Innovation Priorities addressed



See in Appendix I the full list of IPs



Spain Pilot #8

START <Q4 2024 → 2027

9.3 M€ | Co-funded

Project name / acronym

PE LDES

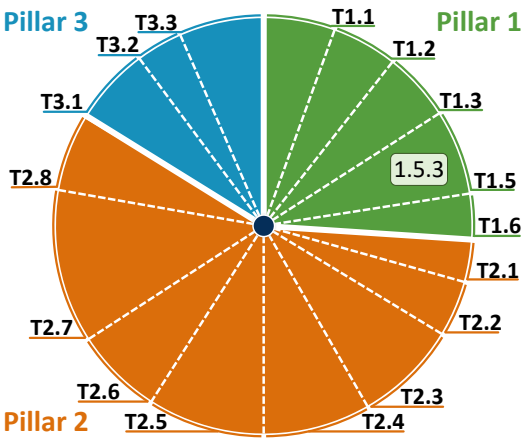
Project short description

With an increasing penetration of renewable energy sources, such as wind and photovoltaic in the grid, long duration energy storage is becoming mandatory in order to balance the energy flow throughout the day. But making energy available at the right times is not enough, as grid stability also needs to be enhanced. That is what this project is about: its target is to scale-up an existing Vanadium Redox Flow Battery (VRFB) technology for utility-scale long duration applications. The resulting battery will be grid scale friendly and will have a duration from 4 to 12 hours. The technology will be demonstrated in a pilot project. Also, critical will be the adaptation of power electronics for lithium batteries to Vanadium redox flow batteries requirements, so these batteries will eventually be able to provide advanced grid support functionalities such as grid forming and black start.

Main involved partners

Gamesa Electric SA (ES)

Innovation Priorities addressed



See in Appendix I the full list of IPs

Spain Pilot #9

START <Q4 2024 → 2028

633 k€ | Co-funded

Project name / acronym

BATOFLOX

Project short description

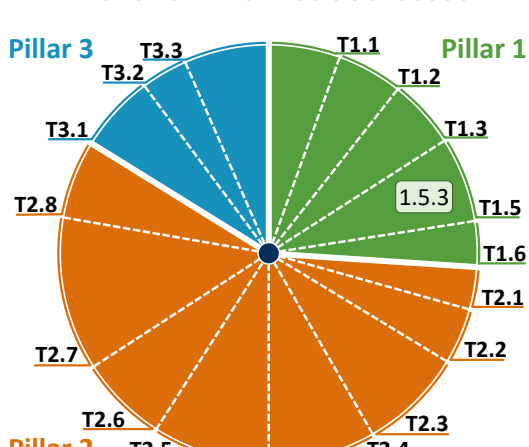
The BATOFLOX project involves the installation of a 1MW power and 1MWh capacity organic battery with redox flow storage technology at the Mula II photovoltaic plant located in Murcia.

The incorporation of this flow battery in the power plant will allow for the storage of renewable energy from the plant and its injection into the electrical grid when the CO_2 emission levels of the electrical system are higher. In addition to compensating for load variations in the power supply grid, it can help eliminate the use of more toxic and difficult-to-obtain metals in the European Union, such as lithium or vanadium, by replacing them with an organic electrolyte. This electrolyte has a high probability (in the short and medium term) of being manufactured from lignin, an organic polymer present in all vascular plants that has better properties for its performance in batteries and would represent a viable alternative for the new generation of environmentally sustainable flow batteries.

Main involved partners

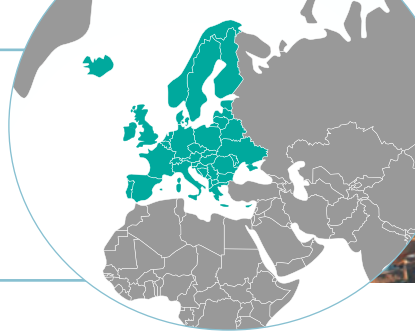
Cobra instalaciones y servicios SA (ES)

Innovation Priorities addressed



See in Appendix I the full list of IPs

CORE MEMBER



SPAIN

Spain Pilot #10

START Q1 2022 — Q1 2026

2.8 M€ | Co-funded

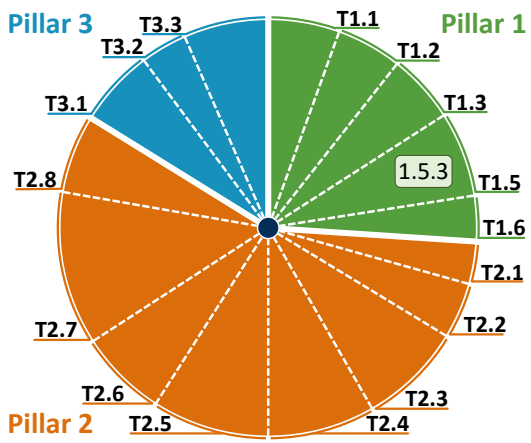
Project name / acronym
REDOX2025

Project short description
Development of Vanadium Redox Flow (VRF) storage technology with Spanish grid-connected technology to be fully competitive on a commercial scale. Power output of 250 kW, energy capacity of 1.05 MWh, ensuring sustained power supply during operation with approximate efficiency of 70%. Autonomy of 4.2 hours allows for extended periods of autonomous operation without frequent recharging or maintenance. VRF batteries permits long service life, easy maintenance, and no environmental impact, in addition to an high and expandable capacity, adaptable power and voltage, and versatility in charge and discharge modes. VRF batteries proved to be resilient to electrolyte contamination and has negligible self-discharge even over long periods. It will be installed on the site of an old coal-fired power station in Asturias. High number of charge and discharge cycles, fast response time, ability for grid frequency control, and its use as an uninterruptible power supply (UPS) make it highly versatile and complementary to renewable energy plants.

Main involved partners
EDP España SA (ES), Inerco Ingenieria Tecnologia Y Consultoria SA (ES), Hydraredox Iberia SL (ES)

Web link
https://www.edp.com/en/innovation/innovation-projects#innovation-energy-storage-and-flexibility

Innovation Priorities addressed



See in Appendix I the full list of IPs

Spain Pilot #11

START Q1 2022 — Q1 2026

349 k€ | Public funded

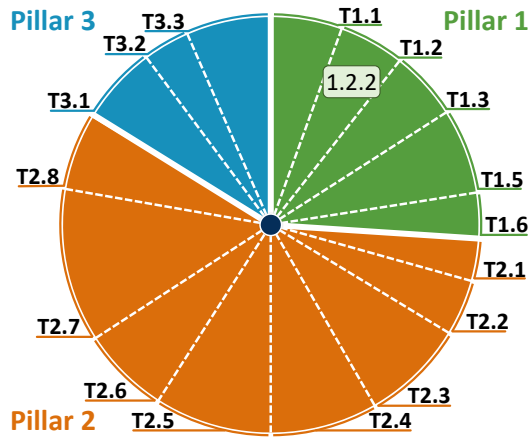
Project name / acronym
UV4WIND

Project short description
This project aims to develop solutions for digitizing operation and maintenance of offshore wind farms using unmanned vehicles. The ultimate goal is to have a digital twin of the park that allows modeling its behavior and having software that gathers all the field data in real-time. The system will consist of an unmanned surface vehicle (USV), a mothership from which unmanned aerial and underwater vehicles will operate, as well as a remote control center where all the information from unmanned vehicle sensors will be centralized. A technological demonstrator will be developed that, through simulation, reflects the capabilities and different missions, including prototype testing in a controlled environment. The e-park project involves, in addition to Navantia as project leader company, Abance Ingeniería y Servicios, Arisnova, Eolos Floating Lidar Solutions, Perseo Techworks, and Sociedad Anónima de Electrónica Submarina (SAES). It is a collaborative project that will contribute to the technological development of industry.

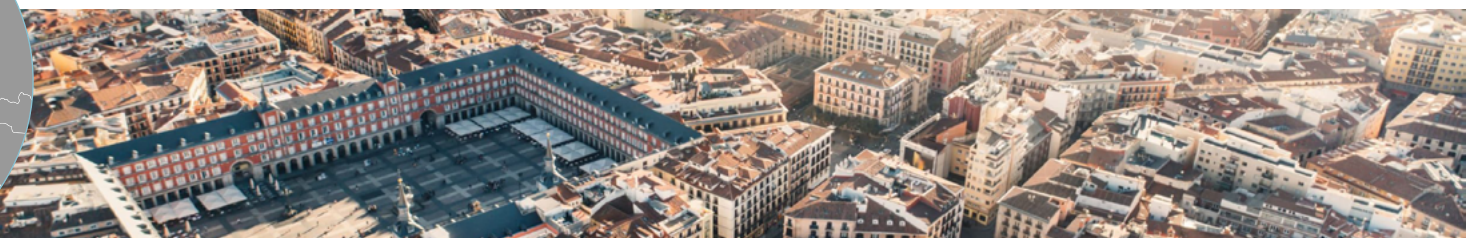
Main involved partners
Navantia (ES), Abance Ingenieria y servicios (ES), Aris Nova, Eolos Floating lidar solutions (ES), Perseo Techworks (ES), Electrónica Submarina (ES)

Web link
https://www.navantia.es/es/actualidad/notas-prensa/primeros-pasos-hacia-el-gemelo-digital-de-parques-eolicos-marinos-el-cdti-apoya-un-proyecto-liderado-por-navantia/

Innovation Priorities addressed



See in Appendix I the full list of IPs



Spain Pilot #12

START Q1 2021 — Q1 2025

1.56 M€ | Public funded

Project name / acronym

SI100

Project short description

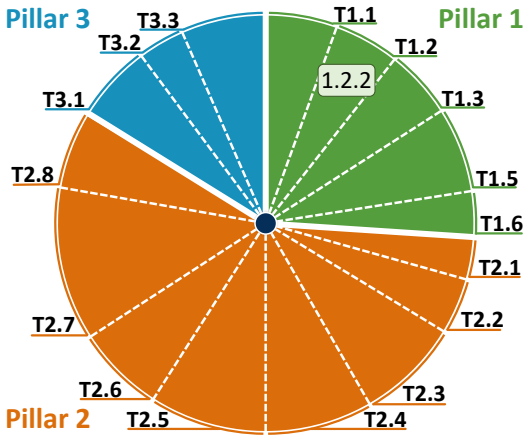
The project aims to develop an affordable, modular, and reliable solution for offshore wind turbines at depths of 60-100 meters. It seeks to reduce installation costs, CO_2 emissions, and space requirements while increasing productivity. The project builds on previous studies and focuses on optimized assembly processes, fixed modular substructures, and material research. Led by ISATI, the consortium includes TETRACE, NBTECH, and INGECID, covering all necessary expertise. The key lies in the jacket-type structure's weight reduction and modularity. Success would bring significant advancements in offshore wind energy.

Through these specific objectives, the project aims to achieve a 30% reduction in installation costs (Capital Expenditure - CAPEX) and CO_2 emissions compared to floating structures, as well as a 60% increase in the productive capacity of this type of structure in port.

Main involved partners

Isati Engineering, Ingecid (ES), Nabrawind (ES), Tetrace 824 (ES)

Innovation Priorities addressed



See in Appendix I the full list of IPs

Spain Pilot #13

START Q4 2022 — Q4 2026

3 M€ | EU funding by Horizon Europe*

Project name / acronym

ABraytCSPfuture

Project short description

ABraytCSPfuture sets forth an innovative, carbon-neutral way for implementing the inherently much more efficient air-Brayton gas turbine power generation cycles into future air-operated Concentrated Solar Plants (CSP), in order to achieve higher solar-to-electricity efficiencies, while significantly increasing the plants' storage capability. Both these functionalities will be made possible by developing and demonstrating the integrated operation of a first-of-its-kind, compact, dual-bed thermochemical reactor/heat exchanger design, based on earth-abundant, inexpensive, non-toxic oxide materials, capable of simultaneously performing (i) heat transfer from a non-pressurized air stream to a pressurized one, while operating simultaneously as a "thermal booster", raising the temperature of the pressurized stream to levels required for gas turbine air-Brayton cycles, (ii) significantly increasing the volumetric solar energy storage density, resulting in hybrid sensible-thermochemical storage systems.

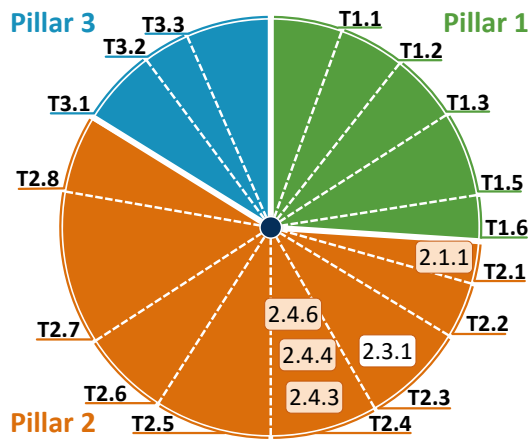
Main involved partners

Deutsches Zentrum Fur Luft - Und Raumfahrt Ev (DE), Ethniko Kentro Erevnas Kai Technologikis Anaptyxi (GR), Universiteit Twente (NL), Fundacion Cener (ES), Fundacion Tekniker (ES), Fraunhofer Gesellschaft Zur Forderung Der Angewandten Forschung Ev (DE), Opra Engineering Solutions Bv (NL), Kraftblock Gmbh (DE), Landson Emission Technologies As (DK), Cobra S.A. (ES)

Web link

https://cordis.europa.eu/project/id/101084569

Innovation Priorities addressed

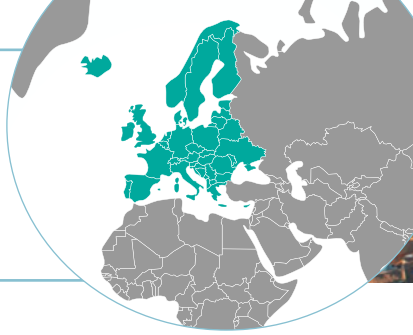


See in Appendix I the full list of IPs

*Funded by EU's Horizon Europe R&I programme

CORE MEMBER

SPAIN



Spain Pilot #14

START Q1 2023 — Q4 2026

5.43 M€ EU funding by Horizon Europe*

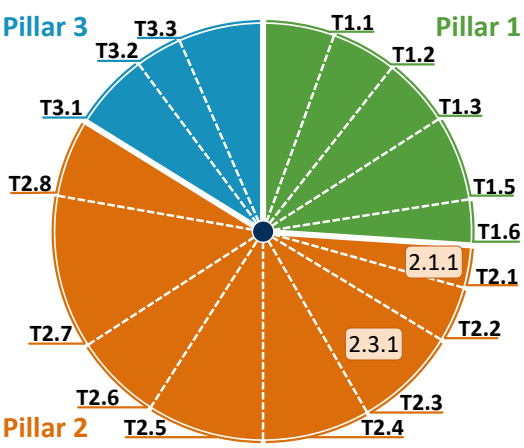
Project name / acronym
AIRE

Project short description
To deliver the future needed renewable energy capacity, wind farm developers will have to use larger turbines, at higher altitudes, explore novel geographical regions and offshore sites. Currently, wind turbines and wind farms are designed and operated considering "just" wind conditions. Consequently, the models do not take into account the physics and aerodynamics of atmospheric wind flows at high altitudes, neither how this is affected by the location, the effect of precipitation and/or sand. This reduces the expected efficiency of wind energy production, and makes hard to estimate the energy outputs, operating costs and lifespan of blades and turbines, increasing variability and the risk to investors and project developers when designing wind farms, reducing the total potential investment. Unless new sites can be identified and designed optimally, the LCOEs will start to rise as developers have to design wind farms that cannot be well predicted with conventional models.

Main involved partners
Fundacion Cener (ES), DTU (UK), VTT (FI), Fraunhofer (DE), ORECatapult (UK), Siemens Gamesa (ES), Green Capital Power (ES), ENGIE (FR), PLOCAN (ES), Universidad De Las Palmas De Gran Canaria (ES), Cartago Ventures (ES)

Web link
https://cordis.europa.eu/project/id/101083716

Innovation Priorities addressed



See in Appendix I the full list of IPs

Spain Pilot #15

START Q1 2023 — Q4 2027

15.5 M€ EU funding by Horizon Europe*

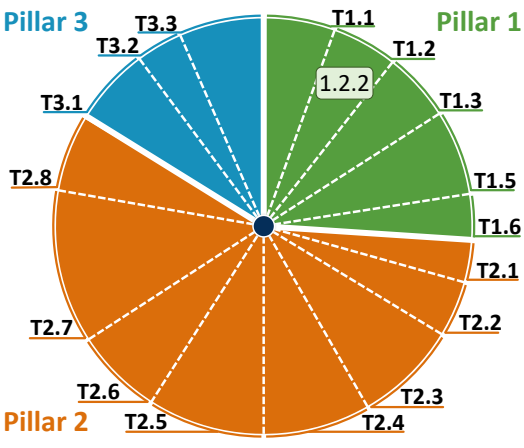
Project name / acronym
BLOW

Project short description
The EU funded BLOW project aims to address the challenge of unlocking offshore wind resources in the Black Sea, where traditional bottom-fixed solutions are not feasible due to the water depth. The project's solution is to develop a 5-MW floating turbine that will allow for the large-scale production of floating offshore wind farms. This innovative and cost-efficient unit will be designed to operate in areas with both low and high wind speeds. To accelerate the energy transition in the region, the BLOW project will take advantage of synergies with the Oil & Gas sector and actively promote societal acceptance and cross-border policy development. The project's goal is to achieve a levelized cost of electricity (LCOE) of 87€/MWh by 2028, with further reductions to 50€/MWh beyond 2030. Moreover, the BLOW project is committed to minimizing the environmental impact of the offshore wind farms and aims to reduce it by 40%.

Main involved partners
IREC (ES), Acciona (ES), EOLIN (FR), Petroceltic (BG), GSP Offshore SRL (RO), Beia Consult (BG), CEPS (BE)

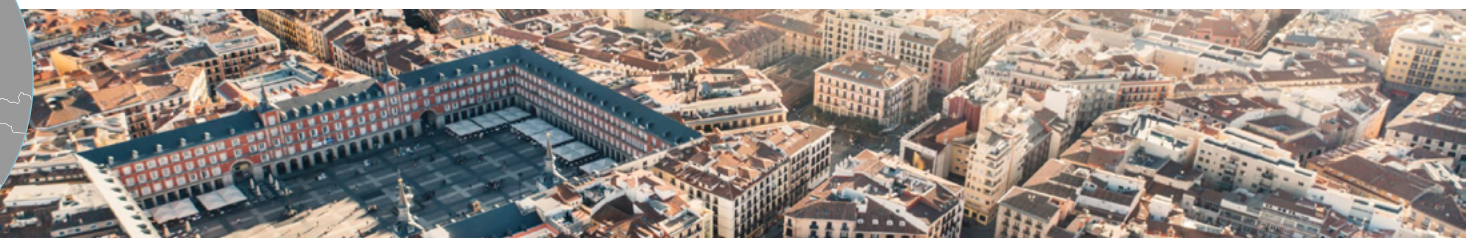
Web link
https://cordis.europa.eu/project/id/101084323

Innovation Priorities addressed



See in Appendix I the full list of IPs

*Funded by EU's Horizon Europe R&I programme



Spain Pilot #16

START Q2 2022 — Q4 2025

6.95 M€ EU funding by Horizon Europe*

Project name / acronym

Data hub for the Creation of Energy communities at Local Level and to Advance Research on them / DATA CELLAR

Project short description

DATA CELLAR aims to create a federated energy dataspace that will support the creation, development and management of local energy communities in the EU. The data space population will be facilitated via an innovative rewarded private metering approach, with a focus on an easy onboarding and interaction, guaranteeing a smooth integration with other EU energy data spaces, providing to LEC stakeholders services and tools for developing their activities.
DATA CELLAR will develop a dynamic, interoperable energy-oriented data platform to support the uptake of the Energy Communities leveraging a blockchain-based tokenization scheme for the remuneration in data and pre-trained AI models provisioning/acquisition cycle. DATA CELLAR will support the need for common dataspaces, focusing on user-friendliness and easy-to-access for non-ICT experts thanks to the availability of a data Marketplace.

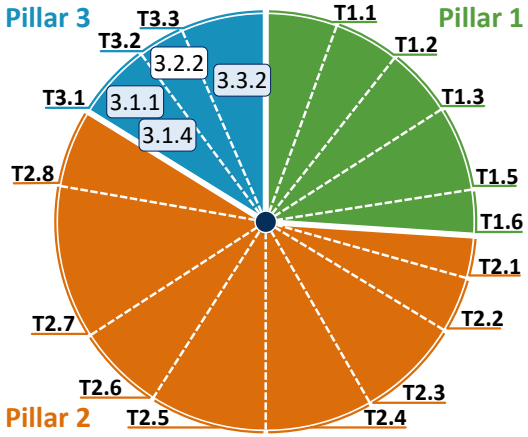
Main involved partners

RINA-C, CERTH (GR), Circe (ES), UBE (BE), NODES, Politecnico di Torino (IT), QUE, Links, CTIC, CEA (FR), EDP, CEZ, Seteco, Iren, IME, IEN (PL), EDF, Eunice, TRI IE, RUG, Zabala, Zabala Inm, EPL (CH), FOSS (CY), AC EMAC, CFOAT, MRAE, FAEN, AEM, TRI UK

Web link

https://datacellarproject.eu/

Innovation Priorities addressed



See in Appendix I the full list of IPs

Spain Pilot #17

START Q4 2022 — Q3 2026

7.64 M€ EU funding by Horizon Europe*

Project name / acronym

FEDErated - system of systems- approach for flexible and interoperable energy COMmunities / FEDECOM

Project short description

According to the EU-funded FEDECOM project, electricity has the potential to become the dominant energy carrier in the future. The project team firmly believes that power grids will serve as the fundamental infrastructure for the decarbonization of all energy sectors. To achieve this, they see aggregators playing a crucial role as facilitators of the widespread utilization of electricity. Building on the successes of previous EU initiatives, the primary objective of the FEDECOM project is to establish integrated local energy systems through the coupling of different sectors and the integration of various energy vectors. This integration will enhance the penetration of renewable energy sources. The project aims to harness the advantages of both direct and indirect electrification strategies to realize its objectives. Ultimately, the team's efforts will culminate in the development of a scalable and adaptable cloud-based platform that will serve as the foundation for the realization of these ambitious goals.

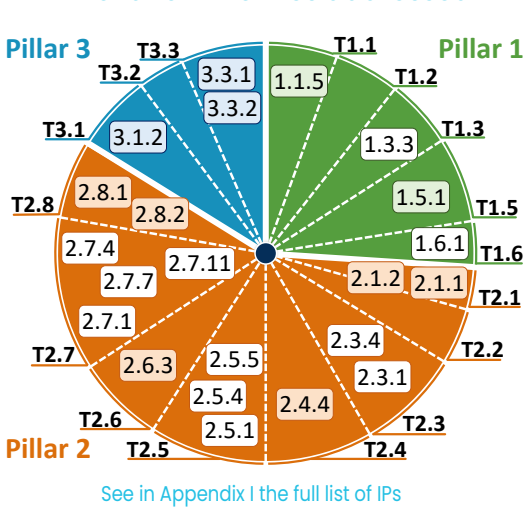
Main involved partners

Giroa-Veolia (ES), Tekniker (ES), Universite Catholique de Louvain (BE), Fraunhofer (DE), Iberdrola (ES), R2M (ES), Grid Singularity (DE), PUPIN (RS), I. LECO (ES), ENBRO (BE), Smart Energy Europe (BE), Energies 2050 (FR), UR BEROA (ES)

Web link

https://cordis.europa.eu/project/id/101075660

Innovation Priorities addressed

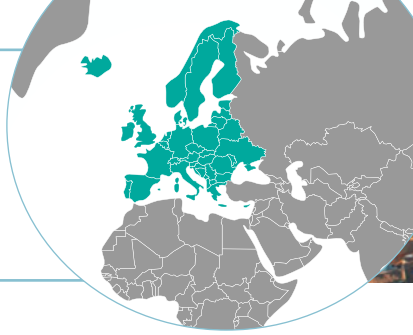


See in Appendix I the full list of IPs

*Funded by EU's Horizon Europe R&I programme

CORE MEMBER

SPAIN



Spain Pilot #18

START Q4 2022 — Q4 2026

15.5 M€ EU funding by Horizon Europe*

Project name / acronym

INFINITE

Project short description

The INFINITE project, aims to provide a solution for the offshore wind industry to install wind farms at water depths beyond 60 m, at competitive prices, helping Europe achieve its full offshore wind potential in line with its green transition goals. The project's primary goal is to demonstrate a floating offshore wind system at 100 m water depth with two key technology innovations. The first innovation is a disruptive and eco-friendly concrete tension leg platform, anchored with an innovative tendon-based mooring system. The second is an innovative aluminium dynamic cable design that is safer, lighter, and cheaper than traditional cables. The project's focus on innovation does not stop at the technology itself. The INFINITE project is also creating an industrial roadmap that will bring together the innovation needs, supply chain readiness, and policy frameworks needed to mass-produce and deploy the new technology. By doing so, the project is not only helping to develop a new, cutting-edge technology but also laying the groundwork for its successful industrialisation.

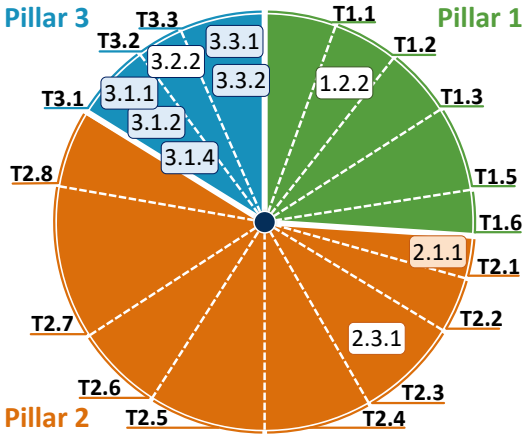
Main involved partners

Acciona Energía (ES), Acciona Construction (ES), WAVEC (PT), Bluenewables (ES), Fundación CENER (ES), ACSM Shipping CO (ES), AVOS (PT), London Offshore Consultants (France), Fulgor Monoprosopi (GR)

Web link

https://cordis.europa.eu/project/id/101084321

Innovation Priorities addressed



See in Appendix I the full list of IPs

Spain Pilot #19

START Q3 2022 — Q1 2026

7.97 M€ EU funding by Horizon Europe*

Project name / acronym

SYNERGIES

Project short description

SYNERGIES introduces a reference Energy Data Space Implementation to unleash the data-driven innovation and sharing potential across the energy data value chain by leveraging on data and intelligence coming from diverse energy actors and coupled sectors. The main aim is making data reachable and widely accessible. SYNERGIES will facilitate the transition from siloed data management to collaborative ones which promote a data and intelligence ecosystem and enable the realization of data intelligence-driven innovative energy services. Three demonstration sites in Greece, Spain and Denmark involving complete value chains will validate data sources, heterogeneous energy systems/assets and spanning different socio-economic characteristics. 4 digital twins (Real-time and Mid-term Network, Community, Prosumer) serve 6 energy apps (Prosumer & Smart Building, Smart Charging EV fleets, Asset Management & Predictive Maintenance, TSO-DSO Scheduling & Flexibility Marketplace, Flexibility Pooling for LECs, Green Power Investment Planning).

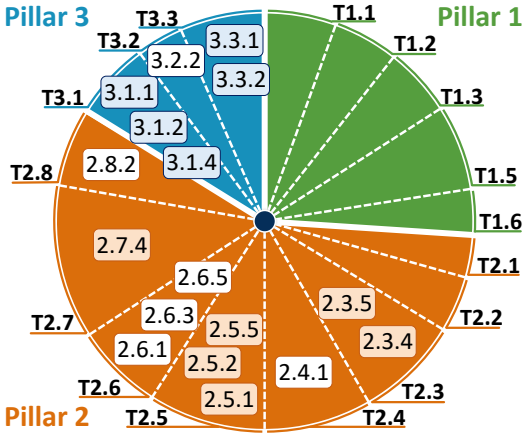
Main involved partners

TXT E-Solutions (IT), Institute of Communication and Computer Systems (GR), Diacheiristis Ellinikou Diktyou Dianomis Elektrikis Energeias (GR), Independent Power Transmission Operator (GR), Energeiaki Koinotita Periorismenis Evthinis (GR), CIRCE (ES)

Web link

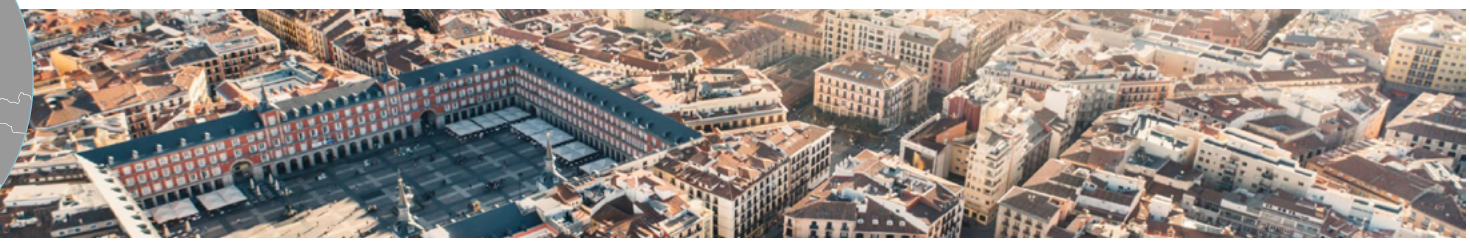
https://energydataspaces.eu/ https://synergies-project.eu/

Innovation Priorities addressed



See in Appendix I the full list of IPs

*Funded by EU's Horizon Europe R&I programme



Spain Pilot #20

START Q3 2020 — Q3 2024

24.9 M€ EU funding by Horizon 2020*

Project name / acronym

Flagship

Project short description

The FLAGSHIP project aims to overcome the challenge of untapped offshore wind resources that are currently not economically viable. It is an EU-funded initiative that seeks to demonstrate and validate a cost-effective 10 MW floating offshore wind turbine (FOWT) to achieve a Levelised Cost Of Energy (LCOE) reduction by 2030. This will be achieved through economies of scale, competitive supply chains and innovative solutions. The project is unique as it will be the first to demonstrate a 10 MW FOWT at a 1:1 scale in the Norwegian North Sea as a pre-commercial wind farm. The FOWT will be installed on a semi-submersible concrete floating platform with a novel anchoring design, new moorings and mooring configuration, and optimised cable designs. The aim is to achieve an LCOE reduction allowing to reach the 40-60 €/MWh range by 2030, making offshore wind resources more economically viable. The project's success will pave the way for large-scale assembly of 500 MW commercial FOW farms in the future, making offshore wind energy feasible in other locations such as the Atlantic Ocean, Mediterranean and Baltic seas.

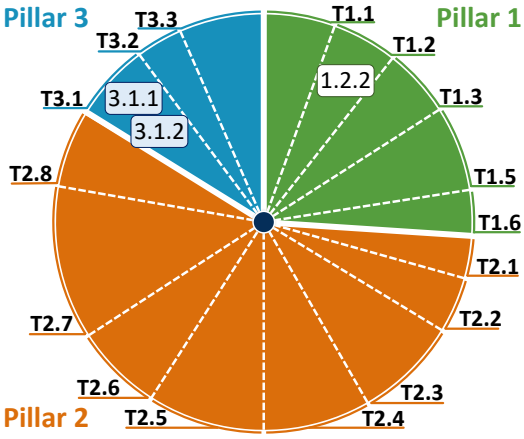
Main involved partners

Iberdrola (ES), IHC (ES), DNV (NO), Zabala (ES), Metcentre, Fundación CENER (ES), Coremarine solutions (ES)

Web link

https://www.flagshiproject.eu/

Innovation Priorities addressed



See in Appendix I the full list of IPs

Spain Pilot #21

START Q1 2020 — Q2 2024

15 M€ EU funding by Horizon 2020*

Project name / acronym

Large demonstratIoN user Centric urban and long-range charging solutions to boosT an engaging deployment of Electric Vehicles in Europe / INCIT-EV

Project short description

One of the cornerstones of INCIT-EV and the basis for all the solutions developed within the project is an enhanced understanding of the EV users' expectations and needs. INCIT-EV will combine different traditional (literature review, public data analysis, surveys, participatory techniques) and more innovative techniques to produce new insights on users' perceptions and factors of influence. One of the most relevant innovations will be the application for the first time in the field of e-mobility of neuroscience techniques combined with bio-signals to identify users' unconscious preferences for charging options. In particular, a mobile sensor equipment will be used to measure the emotions of the users engaged in the different Use Cases (UC) of the project and subsequently infer their unarticulated needs. All these new insights on EV users' behaviour will enable a better characterisation of the different user groups and will feed into the two main pillars of the project: the 10 innovative charging solutions, and the INCIT-EV platform.

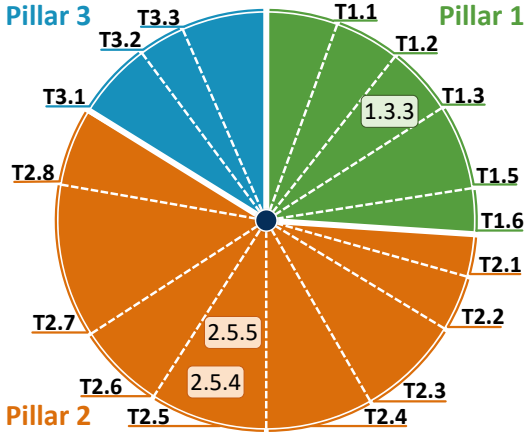
Main involved partners

Circe (ES), Bursa, Eurovia, EVBox, Renault, TRIA, Stellantis, AVERE, Bitbrain, Enedis (FR), Municipality of Turin (IT), Municipality of Zaragoza (ES), IFFSTAR, MRA

Web link

https://www.incit-ev.eu/demonstrations/

Innovation Priorities addressed

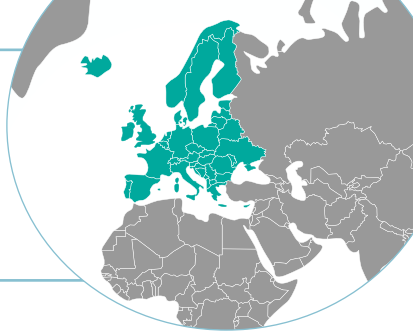


See in Appendix I the full list of IPs

*Funded by EU's Horizon 2020 R&I programme

CORE MEMBER

SPAIN



Spain Pilot #22

START Q4 2021 — Q3 2025

5.67 M€ EU funding by Horizon 2020*

Project name / acronym

RESTORE

Project short description

RESTORE proposes a radically innovative solution for District Heating and Cooling (DHC), based on the combination of two key innovative technologies (TCES, Thermo-Chemical Energy Storage - ORC, Organic Ranking Cycle), that allows integrating a wide variety of renewable technologies combined with competitive seasonal storage in DHC networks, allowing them to be 100% renewable to radically improve their environmental sustainability. The first technology the project aims to develop is an innovative thermal energy storage system based on Thermo-chemical reactions, the Thermo-Chemical Energy Storage (TCES), that provides daily and seasonal competitive energy storage due to its high energy density, very low energy losses and its low-cost. In addition, the project aims to develop a second technology that is based on Heat Pump and ORC adapting the energy provided by different renewable technologies to feed the storage system, that joining the waste heat, can supply the energy demand under the specific conditions laid down by each DHC. The system represents a key development since it allows harnessing the enormous amount of energy.

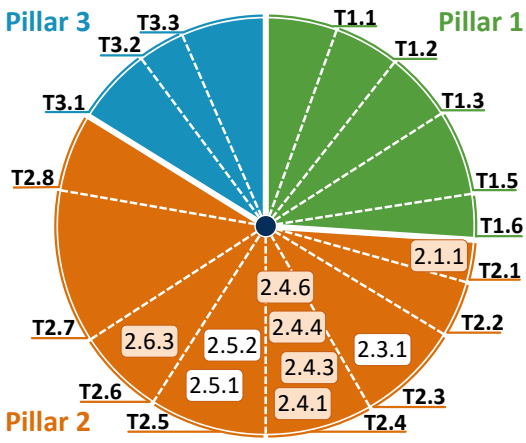
Main involved partners

Fundacion Cener (ES), Technische Universitaet Wien (AT), Politecnico of Milan(IT), Turboden Spa (IT), Enerbasque Sl (ES), Simtech Gmbh (DE), Aalborg Csp As (DK), Steinbeis Innovation Gmbh (DE)

Web link

https://www.restore-dhc.eu/

Innovation Priorities addressed



See in Appendix I the full list of IPs

Spain Pilot #23

START Q4 2021 — Q1 2026

19.9 M€ EU funding by Horizon 2020*

Project name / acronym

oPEN Lab

Project short description

The aim of the oPEN Lab is to identify replicable, commercially viable solution packages enabling the achievement of positive energy neighbourhoods within existing urban contexts that are seamlessly integrated into local energy system as an active micro-energy hub, and to test these technologies and package as an integrated solution at neighbourhood scale. Three open innovation living labs in the cities of Genk (BE), Pamplona (ES) and Tartu (EE) will test combinations of different close-to-market ready technologies and services and study their performance as a unique operating system. Focus is on demonstrating innovations in an integrated approach combining sustainable design tailored to the local context, seamless industrial renovation workflows, renewable energy generation combined with energy storage systems, urban service facilities and smart operation, life cycle thinking and circularity across the whole value chain, targeting the whole life cycle of the building and its neighbourhood.

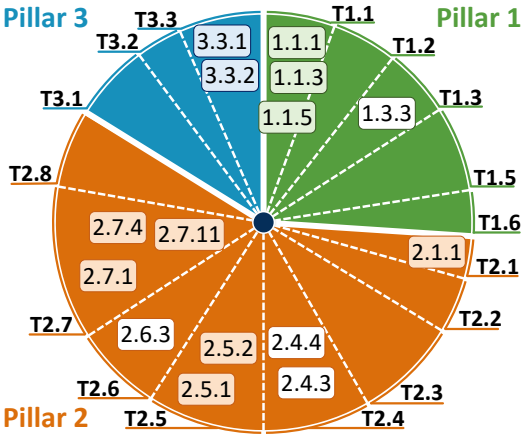
Main involved partners

VITO (BE), IMEC (BE), KU Leuven (BE), Fundación CENER (ES), Ayuntamiento Pamplona (ES), Tartu Linn (EE), Stad Genk (BE), Universidad País Vasco, Euroepan Network Of Living Labs, Haute Ecole Specialisee De Suisse Occidentale, Tallinna Tehnikaülikoovito (BE), IMEC (BE), KU Leuven (BE), Fundación CENER (ES), Ayuntamiento Pamplona (ES), Tartu Linn (EE), Stad Genk (BE), Universidad País Vasco (ES), European Network Of Living Labs, Haute Ecole Specialisee De Suisse Occidentale (CH), Tallinna Tehnikaülikoo (EE)

Web link

https://openlab-project.eu/

Innovation Priorities addressed

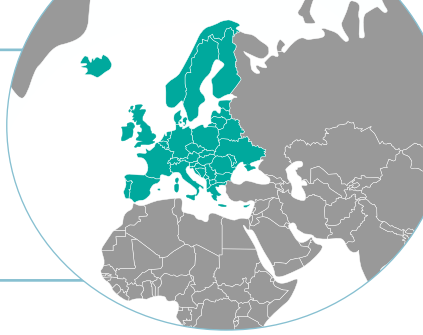


See in Appendix I the full list of IPs

*Funded by EU's Horizon 2020 R&I programme

CORE MEMBER

ALPERIA



Involved Sector

Alperia group contributes to Green Powered Future Mission as a Tier 1 industry member since 2021. Alperia will leverage on its track record and set of competences in the sector of energy generation; energy storage and sector integration (e.g. vehicle-to-grid); smart distributions grid and artificial intelligence.

Decarbonisation goals

Alperia aims to conduct a demonstrator project to enhance the integration of non-programmable renewable sources in the energy systems with a focus on mountain areas. The decarbonisation goals of the project include, but are not limited to: increasing renewable generation through floating PV and advanced forecasting in hydropower; improving energy storage solutions combining electrochemical, pumping and vehicle-to-grid, self-consumption and integrating the above elements in the smart grid.

Main innovation activities

The project implements several different topics and priorities to test overall system flexibility objectives, spanning from testing hydropower plants flexibility when combined with energy storage, to power-to-mobility technical solutions in combination with self-consumption schemes towards sector integration, to floating PV in hydropower plants and advanced grid management integrating diffused generation.

Alperia Pilot #1

START Q4 2023 → 2026

8-12 M€ Co-funded | INCO

Project name / acronym

Energy Flexibility in mountain regions

Project short description

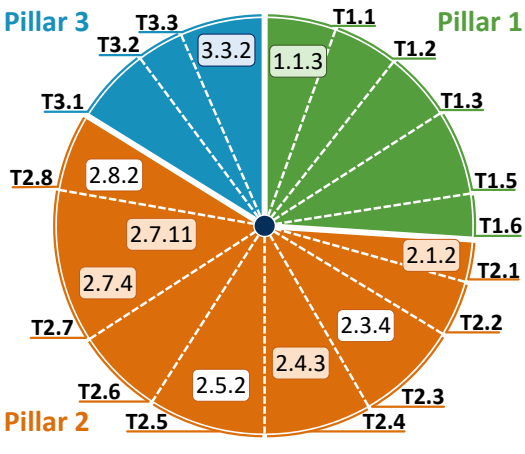
The project implements several different topics and priorities (referred to specific initiatives currently ongoing) to test overall system flexibility objectives:

- Flexibility potential on hydropower plants thanks to a) more accurate water flow predictions and demand forecasting supported by Artificial Intelligence algorithms and b) storage solutions to be implemented in existing HPPs configuration with new Battery Energy Storage Systems or further exploited in case of existing pump storage plants.
- Power-to-mobility and power-to-x solutions in a self-consumption scheme connected to existing Hydropower or new PV plants to test flexibility from sector integration.
- Floating PV plants to be installed in existing water basins combined with self-consumption schemes of local renewable energy communities of small- and medium-scale, including residential PV plants and behind-the-meter storage systems.
- Grid infrastructure flexibility integrating diffused generation units and improved grid management with real-time data on the distribution grid performance.

Main involved partners

Alperia (IT), RSE (IT)

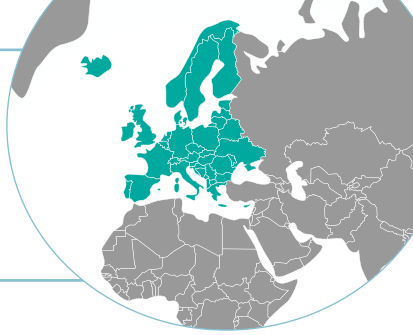
Innovation Priorities addressed



See in Appendix I the full list of IPs

CORE MEMBER

ARETI



Involved Sector

Areti, part of Acea group, the largest Italian multi-utility, is the DSO of the City of Rome, serving 2.9 million people by operating 30.000 km of grids all voltages, 72 HV/MV stations, more than 13.000 MV/LV station and managing 1,7 million connection points.

Decarbonisation goals

Areti mission is strongly focused on making its grid every day smarter and more digitalized to support decarbonisation: that's why Areti is currently involved in several international projects to create to improve the grid smartness and create a fully inclusive local flexibility market TSO/DSO coordinated. Thanks to the Areti's actions, the total CO_2 reduction anticipated in 2032 in the City of Rome amounts at ~ 2.500 ktons.

Main innovation activities

The research activity aims to improve grid observability, resilience and DER Hosting Capacity. These actions are carried out by developing several Europe Projects (Platone, FLOW, BeFlexible), the National Regulatory Agencies (NRA) driven project for local flexibility market "RomeFlex", designing and releasing technological equipment and platforms like the Flexibility Register, the BlockChain Access Layer, the PGUI (Power Grid User Interface), the open source ADMS and test laboratories like the Smart Park Areti.

Areti Pilot #1

Project name / acronym

Massive Deployment of Demand Response for Grid Operation Optimization, with focus on Energy Communities

Project short description

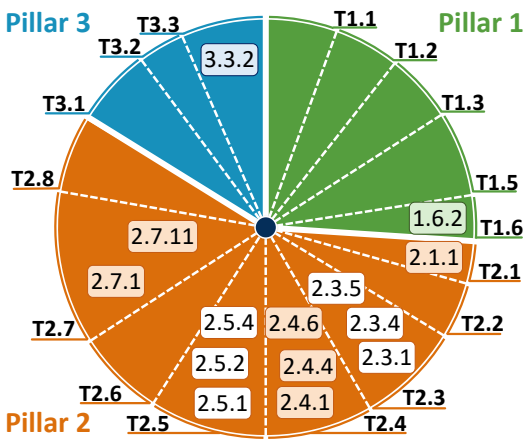
Based on Areti studies, in the next ten years Rome's grid capacity peak will increase by 50% due load electrification, with the risk of operational issues (congestions, voltage violations, outages) jeopardising the ongoing decarbonisation process in Rome. For this reason, Areti needs the widest involvement of all customers (starting from the smallest 3kW ones and arriving to large HV customers) in Demand Response processes and a well-established local flexibility market fine-tuned with TSO's one by Traffic Light mechanisms.
Energy Communities can play a central role in this process, by their capability to aggregate distributed generation and flexible consumptions mobilizing and exploiting the collective optimal flexibility potential of individual energy consumers.

The main project objective is to enable the optimal management of distribution grid and the socializing of the surplus of generated and not self-consumed electricity among a subset of vulnerable consumers at high risk of energy poverty.

Main involved partners

Areti (IT), RSE (IT), Municipality of Rome (IT), other national and international partners

Innovation Priorities addressed

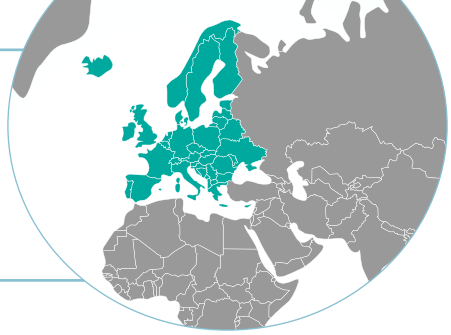


See in Appendix I the full list of IPs

CORE MEMBER

areti

ARETI



Areti Pilot #2

START Q3 2024 — 2026

20 M€ Co-funded | INCO

Project name / acronym

Smart Charging and V2G Tools involving all Electrical Vehicles while focusing on EVs for Public Transportation to foster Grid Operation Optimization

Project short description

Rome will be the Italian city most affected by the transportation transition to the electrical vector, causing by itself a capacity peak increase of the Areti's grid of around 500 MW in the next ten years. Even though the impacts on the grid will be so significant, the benefits on CO_2 reduction will be crucial for the decarbonisation of Rome, where almost 30% of total GHG production is due to transportation.

The Project aims to develop at a very high maturity level effective and efficient tool to enable a positive interaction between Charging Stations for all kind of EVs (cars, trucks, buses…) making them a primary source of Demand Response services to optimize the Rome's distribution grid operation.

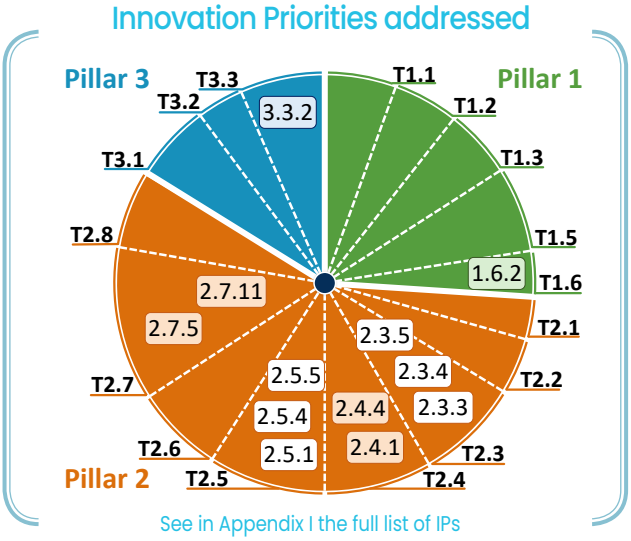
According to the above depicted scenario, the Municipality of Rome is strongly potentiating the electrification of public transportation, and one of the scopes of the project will consist in the integration of the big charging stations for buses into the flexibility mechanisms of the Areti's grid, even increasing the local flexibility market liquidity.

The pilot will also exploit the "Areti Smart Park", the Areti's laboratory for Electromobility equipped with RES generation, storages and advanced control system of charging stations for the Areti's EV fleet, to test specific Smart Charge and V2G technologies.

Main involved partners

Areti (IT), RSE (IT), Municipality of Rome (IT), other national and international partners

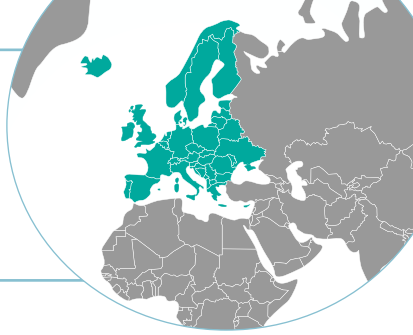
Innovation Priorities addressed



See in Appendix I the full list of IPs

SUPPORT MEMBER

BSI GROUP



Involved Sector

BSI, the UK's National Standards Body, is at the forefront of setting and developing the standards that support a greener and sustainable future.
As the energy sector undergoes a drastic shift towards a net zero grid, BSI is dedicated to providing the standards and frameworks that support and accelerate this transition.

Decarbonisation goals

As the national standards body, BSI recognises the pivotal role of standards in decarbonisation and in support of the Green Powered Future Mission, which focuses on integrating 100% renewable energy across varying geographies by 2030, while ensuring cost efficiency, system resilience and security.
Our objective is to align with this vision and ensure that standards facilitate and support interoperability and flexibility of emerging technologies, enabling a cost-efficient, secure, and resilient system in any geography.

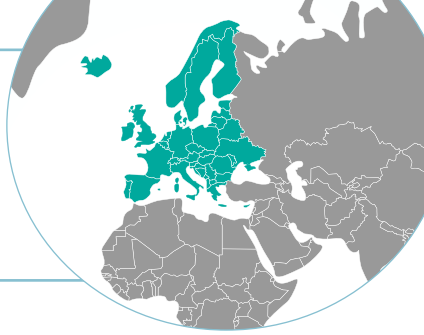
Main innovation activities

BSI is committed to supporting the Green Powered Future mission and proposed to create a Standards Centre of Excellence.
This initiative, subject to demand and external funding, envisions a dynamic collaboration with Mission Innovation demonstrator projects.

The Centre's primary goal is to identify and address standards gaps, ensuring a robust support system for energy resilience and flexibility. This endeavour aims to support the drive towards innovative and sustainable energy solutions.

CORE MEMBER

ENEL GRIDS



Involved Sector

Enel Grids is the business line that manages Enel Group's electricity distribution worldwide. As a Core Team member of the GPFM, Enel Grids is fully involved in the Mission and aims to contribute with innovative pilot projects in the framework of Flagship Project 1 "5 demos in five continents".

Decarbonisation goals

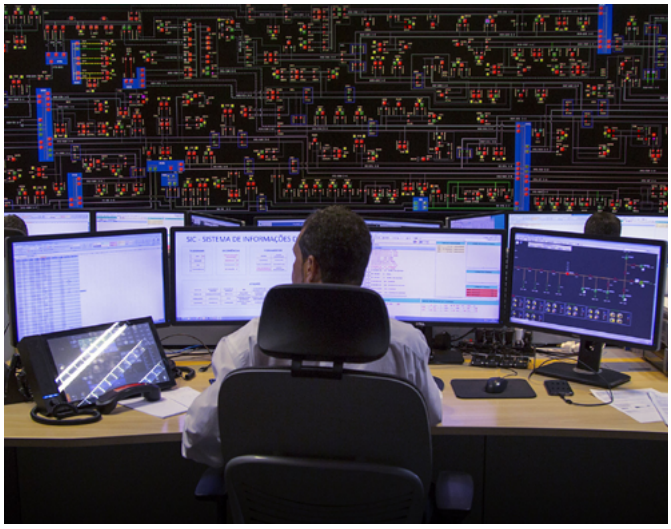
Enel Grids delivers electricity through a network of around 2 million kilometres to 73 million end-users in 8 countries around the world. Its ambition is to deliver the best quality of service to customers, developing a sustainable integration of the grids, reducing environmental impact along the entire value chain, and pursuing operational excellence with a global industrial vision: "Grid Futurability".

Main innovation activity

Enel Grids leverages innovative technological developments and promotes clean electrification focusing on three main streams:

(i) robotization of the fields activities and digital devices adoption to maximize safety and operational excellence;
(ii) digital grid, robot friendly, super connected and with low environmental impact;
(iii) optimization of grid operation and planning through flexibility of distributed energy resources and new services offered by grid.

Please notice that the Pilot #6 and Pilot #7 fiches reported in this section refer to relevant European projects as selected by Enel Grids.



Enel Pilot #1

START <Q4 2023 — 2025

Public funded

Project name / acronym

Energia da risorse Distribuite per la Gestione della rete di E-Distribuzione / Edge

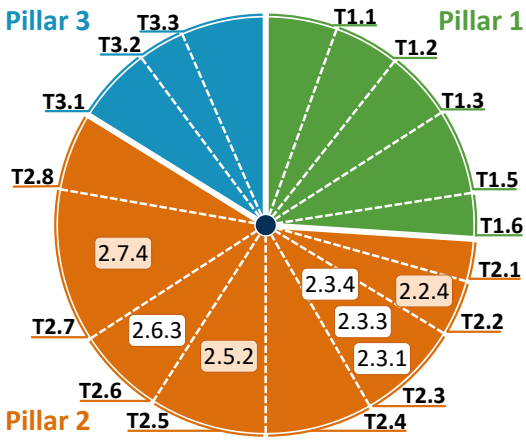
Project short description

The pilot project Edge concerns the design of 'local ancillary services' market in Italy – flexibility related to distribution grid congestion management. It was required by National Regulatory Agencies (NRA) to test the DSO needs planning, the products definition, procurement and operational procedures. The project will be carried out by e-distribuzione within 4 areas (Foggia, Benevento, Cuneo, and Venice); services can be offered by any customer or an aggregate set of customers that complies with the technical requirements and passing the pre-qualification test. The flexibility services will be compensated according to the contract conditions (both for availability and actual utilization) coming from 'pay-as-bid' competitions performed in third party market platform. The bilateral contracts ensuring availability of flexibility services in the seasonal time-window are supposed to last 1-2 years.
Note: capital and operational costs sustained for the pilot project are expected to be recognized by NRA under current tariff regulation or dedicated cost allocation account, as by Delibera 352/2021.

Web link

https://www.e-distribuzione.it/progetti-e-innovazioni/il-progetto-edge.html

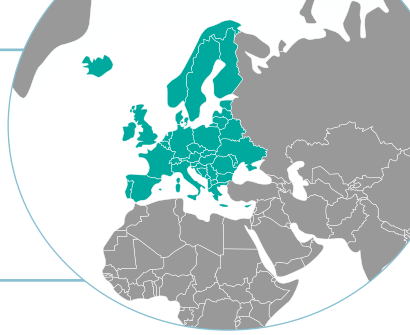
Innovation Priorities addressed



See in Appendix I the full list of IPs

CORE MEMBER

ENEL GRIDS



Enel Pilot #2

START Q3 2023 — 2024

3.8 M€ | Co-funded | INCO

Project name / acronym

Enel project under 3DEN (IEA) initiative

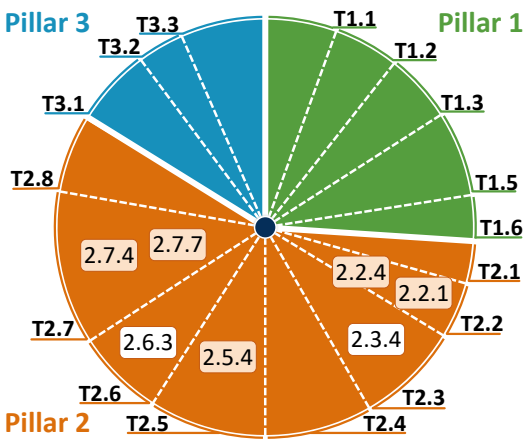
Project short description

The project, based in Colombia within the concession area of Enel Colombia, aims to accelerate progress on power system modernization and effective utilization of distributed energy resources through policy, regulation, technology, and investment guidance.
It consists in testing a real time demand response program focused on alleviating network congestions in order to avoid highly impacting disconnections, with active participation of customers, who respond to economic incentives. The mechanism will be included in the operation of the network, through the implementation of a communication interface between DERMS (Distributed Energy Resources Management System) and the power grid.
The expected output of the project is to provide a flexibility scheme based on demand response mechanism for the DSO, to decrease peak power (congestion management), to assure the quality of supply in response to grid challenges, optimizing the investment plan.

Main involved partners

Enel Grids, Enel Colombia, Gridspertise, POLIMI

Innovation Priorities addressed



See in Appendix I the full list of IPs

Enel Pilot #3

START 2024 — 2027

<3 M€ | Public funded

Project name / acronym

Flexibility Products for Energy Transition / Expert

Project short description

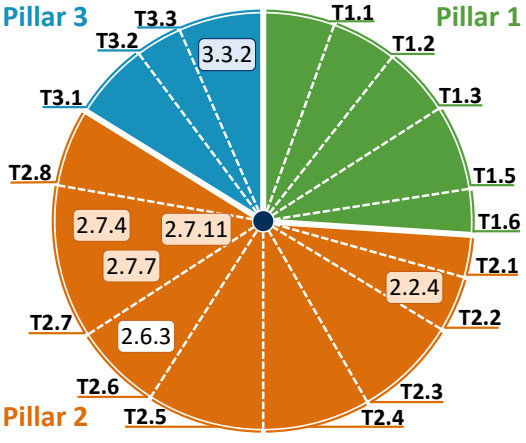
The Expert project (Flexibility Products for Energy Transition) consists in evaluating the feasibility of applying flexibility to improve the operation of the DSO.
Main services to be analysed are voltage control, congestion management (including reducing load profile during peak hours) and emergency management (to reduce negative impacts of outages).
The testing will be carried out by means of a demonstration in São Paulo and the flexibility activation mechanism will be included in the operation of the network, through the implementation of DERMS (Distributed Energy Resources Management System). The results will allow for a complete analysis of flexibility services, including its technical, economic and regulatory aspects.

The project could be part of ANEEL R&D program that is an initiative from Brazil's regulatory authority with the objective of investing in innovative projects that prove to be perfectly applicable, relevant and economically viable for the local electricity sector.

Main involved partners

Universidade Federal do Pará, CONCERT, Enel Grids

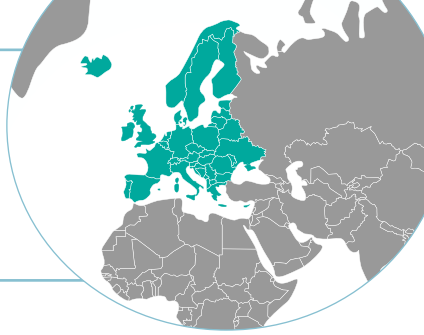
Innovation Priorities addressed



See in Appendix I the full list of IPs

CORE MEMBER

ENEL GRIDS



Enel Pilot #4

START Q2 2021 — Q2 2024

8.38 M€ Co-funded | INCO

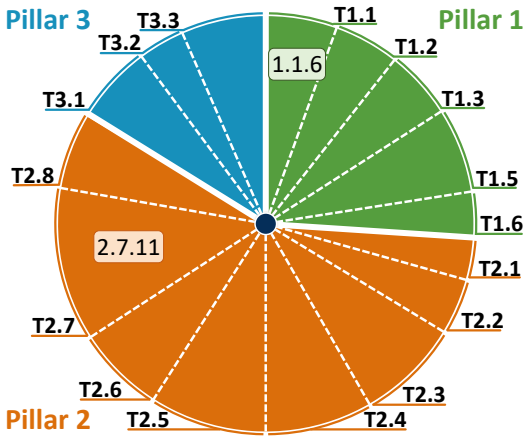
Project name / acronym
PHOTORAMA

Project short description
PHOTORAMA has the objective to develop and demonstrate the industrial prospective of innovative solutions dedicated to recovery and recycling of the valuable and critical Raw Materials (RM) from End of Life PV modules, in order to significantly contribute to European RM. The guidelines and framework are built to boost modern solutions to minimize waste and achieve high secondary raw materials recovery rates (for glass, silicon, silver, indium and gallium) and to demonstrate full circularity by re-injecting the secondary RM in inter-disciplinary value chains. A complementary consortium of 14 European companies and research institutes has built the framework of PHOTORAMA. The project will strengthen this ambitious model with environmental impacts assessments and a strategic dissemination and exploitation plan supported by a strong effort for raising societal awareness. The implementation of PHOTORAMA recycling scheme would unlock already more than 100,000 tons of valuable secondary raw materials by 2030.

Main involved partners
Commissariat à l'Énergie Atomique et aux Énergies Alternatives (CEA), Mondragon Assembly Sociedad Cooperativa (MASS), PV Cycle France (PVCYC), RHP Technology GMBH (RHP), Luxchemtech GMBH (LUX), MALTHA Glasrecyclage Belgie (MALTHA), SINTEF AS (SINTEF), Agenzia Nazionale per le nuove tecnologie, L'energia e lo Sviluppo Economico Sostenibile (ENEA), DFD - Dense Fluid Degreasing (DFD), IDENER Research & Development Agrupacion De Interes Economico (IDEN R&D)

Web link
https://www.photorama-project.eu/

Innovation Priorities addressed



See in Appendix I the full list of IPs

Enel Pilot #5

START Q4 2022 — Q4 2023

INCO

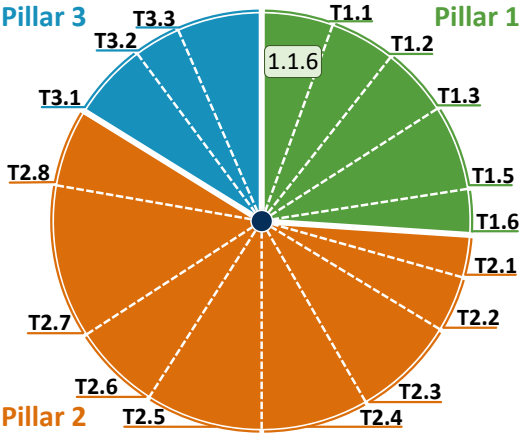
Project name / acronym
ROSI

Project short description
Enel Green Power cooperates with French startup ROSI in order to test their innovative technology and processes for the recovery of strategic materials from Enel PV module waste (silicon glass-backsheet modules) and PV manufacturing Heterojunction Technology (HJT) cells scrap from 3SUN facility, by increasing the overall recovery ratio and purity of materials. The startup offers an innovative technology for extracting and recycling high-value materials from End of Life PV panels.
In particular, the recycling process consists of a sequence of mechanical, thermal, and chemical treatments: the first step removes the aluminium frame and junction box, the thermal system based on pyrolysis decomposes the polymeric layers, separating the glass and leaving access to the cell fragments which are treated by the final chemical step for the recovery of silver and silicon.

Main involved partners
ROSI, ENDESA SA, EGP SpA

Web link
https://www.rosi-solar.com/

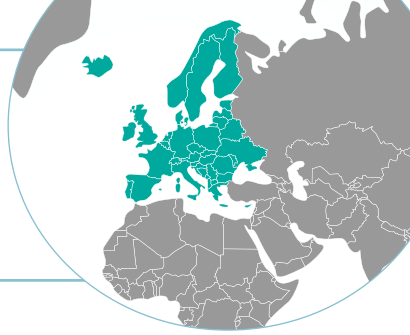
Innovation Priorities addressed



See in Appendix I the full list of IPs

CORE MEMBER

ENEL GRIDS



Enel Pilot #6

START Q3 2022 — Q3 2026

8 M€ EU funding by Horizon Europe*

Project name / acronym

Boosting engagement to increase flexibility / BeFlexible

Project short description

BeFlexible aims to increase the flexibility of the energy system, to improve cooperation between DSOs and TSOs and to facilitate the participation of all energy-related stakeholders. Within the Italian demo, the coordinated qualification and procurement, activation, and validation of local and global flexibility services will be tested with TERNA and Areti. The Italian demo also includes test on advanced solutions for remote control and grid automation, allowing data exchange between the DERs (Distributed Energy Resources) and the DSO/TSO, possibly via the BSP (Balancing Service Provider). In the Spanish demo, the provision of flexibility with small resources (water heating devices) to solve grid congestions at distribution level and prequalification, procurement, activation, and validation of local flexibility services will be tested.
The main outcome will be the Common Flexibility Register, the Dynamin Traffic Light and the communication protocol interface between DERMS and on field devices.
It is a project funded by Horizon Europe program.

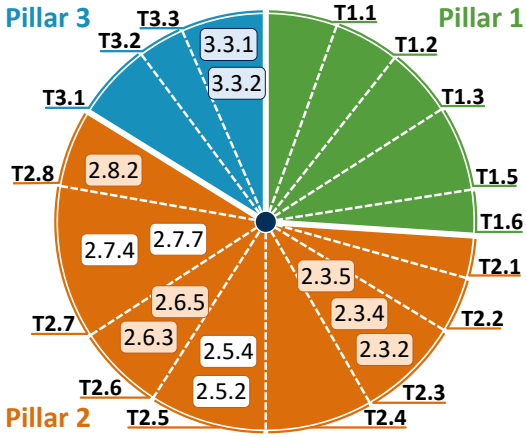
Main involved partners

i-DE (ES), IBCLIES (ES), Enel Grids (IT), EDE (ES), EDI (IT), GSP (IT), Terna (IT), Areti (IT), RSE (IT), E.ON (SE)

Web link

https://beflexible.eu/

Innovation Priorities addressed



See in Appendix I the full list of IPs

Enel Pilot #7

START Q3 2022 — Q2 2026

9.87 M€ EU funding by Horizon Europe*

Project name / acronym

Optimal integration of EVs deployment Wave / Flow

Project short description

Flow is a 4-year project, launched in July 2022 by a consortium formed by 30 European entities, including companies, research organisations and associations from 9 different countries. The project will provide answers for the upcoming mass deployment of electric vehicles to all actors involved, ranging from power distribution system operators, charging point operators, mobility service providers, infrastructure manufacturers to final users. The main aim is to validate and quantify the benefits associated with electric vehicle charging flexibility, alleviating grid problems, in order to achieve energy decarbonisation while transitioning to a sustainable mobility model. During the project, the Congestion Management through flexibility service will be tested (considering an Aggregator of Electric Vehicles as Flexibility Service Provider and Smart Charging and Vehicle to Grid as enabling technologies) and test the prequalification, procurement in local market, activation, and validation of flexibility services. Flow is a project funded by Horizon Europe program.

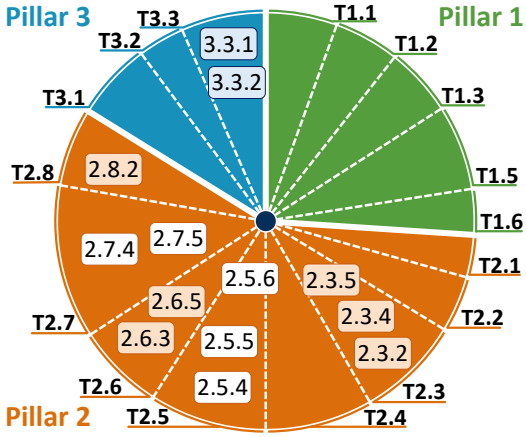
Main involved partners

IREC (ES), DTU (DK), TUD (NL), Heliox (IT), RSE (IT), Enel Grids (IT), EDE (ES), EDI (IT), Areti (IT), Enel X (IT)

Web link

https://www.theflowproject.eu/

Innovation Priorities addressed



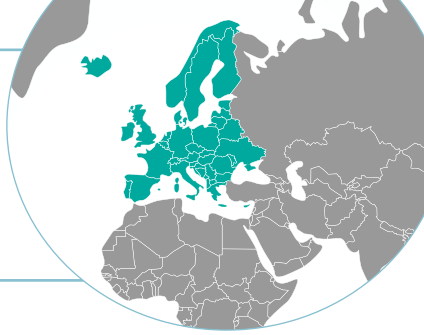
See in Appendix I the full list of IPs

*Funded by EU's Horizon Europe R&I programme

SUPPORT MEMBER

GSE

GESTORE DEI SERVIZI ENERGETICI



Involved Sector

GSE (Gestore dei Servizi Energetici SpA) is an Italian publicly-owned company which promotes the development of renewable energy sources, energy efficiency and sustainable mobility in Italy. GSE fosters sustainable development by providing economic support to renewable electricity generation and taking actions to raise awareness of environmentally-efficient energy use. To this end GSE manages around €15 bn per year in order to incentivise the clean and net-zero energy transition.

Decarbonisation goals

GSE has been designated by the Italian State to pursue and achieve the goals of environmental sustainability and net-zero emissions energy transition. GSE constant commitment is to enable clean energy transitions and to make sustainability an integral part of its corporate culture, strategy and daily business operations. Since 2011 GSE has been involved in the UN Global Compact confirming, year after year, its commitment toward the initiative and the goals to be achieved. GSE's activities contributes to the UN 2030 Agenda reaching the SDG # 4, 7, 8, 9, 11, 12, 13.

Main innovation activity

GSE is committed to:

- Manage the incentive mechanisms for renewable sources, energy efficiency, ETS and sustainable mobility;
- Carry out sector studies, scenarios, statistics on energy transition and RES development;
- Collaborate with international agencies and national Ministries as implementing body (e.g. IEA TCPs and LTES IRENA Campaign) and being involved in EU activities;
- Manage capacity building international projects (e.g. Twinning projects in Palestine, Georgia, Malawi, Albania);
- Launch innovative projects in order to promote RES, local energy communities, behavioural changes and self-consumption sectors (e.g. the GSE PV self consumption portal www.autoconsumo.gse.it to inform possible prosumers to evaluate the potential of a PV installation promoting the active role of consumers as prosumers).

GSE Pilot #1

START Q2 2023 — Q4 2025

2.5 M€ EU funding | INCO

Project name / acronym

Strengthening the Institutional and Technical Capacity of the Malawi Energy Regulatory Authority (MERA)

Project short description

The project is entirely financed by EU trough the Twinning instrument. Twinning projects are based on a peer-to-peer institutional cooperation between EU Member States' Public Administrations and Public Administrations of Beneficiary Countries. The aim is to support implementation of national development strategies in line with EU standards and best practices. The current Twinning project overall objective is to support the modernization and industrialization of the Malawian economy. The specific objective is to enhance the governance of the Malawi energy sector by strengthening the Institutional and Technical Capacity of the Malawi Energy Regulatory Authority (MERA). The project is divided in four intertwined components:

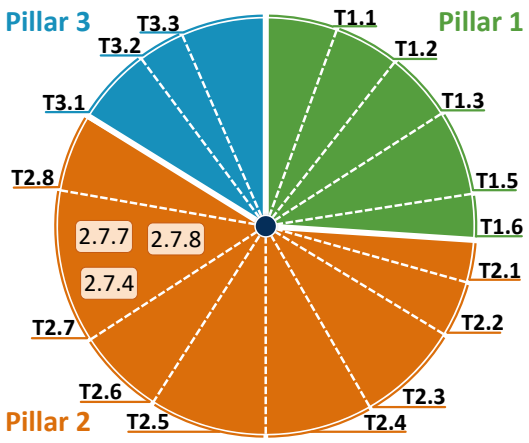
- Component 1 - to review and strengthen MERA institutional set-up / governance and organizational / operational processes.
- Component 2 - to strengthen MERA's technical capacity.
- Component 3 – to strengthen the economic regulation and market analysis.
- Component 4 – to strengthen the legal capacity, administration, consumer support and digitalization processes of MERA.

Most of the activities will be done in Malawi with periodic technical missions of EU partner institutions' expert working side by side with MERA employees and other officers from other institutions working on the energy sector in Malawi. MERA representatives will be involved in study visits in EU Member State Countries as well.

Main involved partners

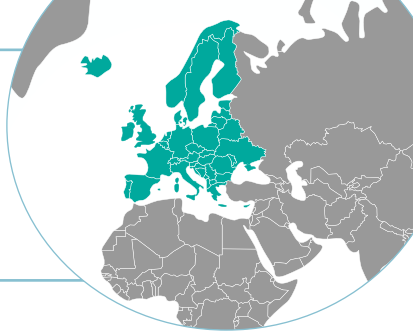
GSE group (leading partner), Eutalia (IT) URSO (Slovak energy regulator, SK) and RDA (Regional Development Agency, SK)

Innovation Priorities addressed



See in Appendix I the full list of IPs

CORE MEMBER



ICEBREAKER ONE

Involved Sector

Icebreaker One connects organisations across energy, finance, water, transport, agriculture and the built world to unlock data flow that delivers net zero impact. It connects assurable real economy data with the financial economy.

Decarbonisation goals

Icebreaker One aims to influence investment decisions of $3.6 bn to deliver demonstrable net zero by 2030. It convenes organisations to understand how best to use data as a continuous flow of evidence that informs action. It is helping to instrument net zero by connecting policy, strategy, risk management and investment to real-world data. This will enable the design and implementation of climate-ready financial instruments, unlock climate-aware risk management and facilitate climate-credible deployment of robust, long-term solutions.

Main innovation activity

Icebreaker One is creating a web of net-zero data; connecting finance, industry and environmental data to inform net-zero decisions.
The core innovation is around data governance and assurance and market-wide scale.
The Icebreaker One Trust Framework helps create and apply rules to enable data to flow between organisations in a controlled, legal, secure, decentralised and distributed manner. It is co-designed with private and public actors through an Icebreaking processes that brings together regulators, government, academics, and industry to co-create rules and processes that can be implemented in markets at speed.

IB1 Pilot #1

START Q3 2024 — 2026
1 M€ Co-funded INCO

Project name / acronym

Open Energy - Flex (OE-F)

Project short description

This project will improve the sharing of reliable data securely among organizations involved across the flexibility value chain. Trust in data is essential so a 'Trust Framework' approach will be used to develop and promote open standards that unlock verifiable and assurable data flows. Open Energy, founded in 2020 with UK Government backing, addresses the core problem of exchanging digital energy information between organisations using a decentralised architecture for data governance and sharing. Research shows:

1) User needs are diverse, encompassing thousands of organisations, customers and society.
2) There is no 'single data platform' approach that will (or should) address all needs.
3) There is a material risk to implementation unless governance is addressed.

The key innovation is in data governance, verification and assurance: enabling a decentralised approach where data and metadata can be shared by being maintained and managed across a distributed ecosystem, on each data custodian's own infrastructure. It addresses technical (e.g. metadata) and non-technical (e.g. legal, IP, policy) in a cohesive framework, collaboratively designed by value chain participants.

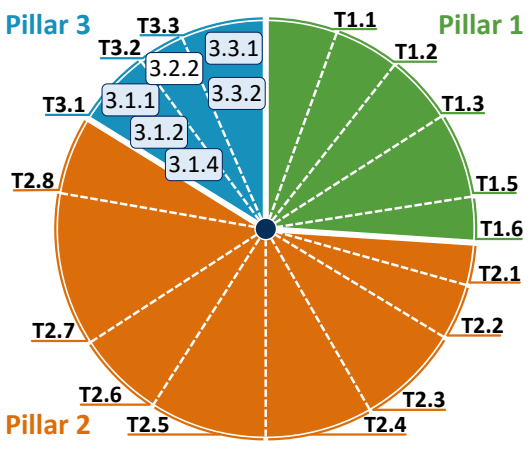
Main involved partners

Open Energy is funded by public and private sector (e.g. SSEN, Elexon, SmartDCC), and operated by Icebreaker One, an independent non-profit making data work harder to deliver net zero. The Mission Innovation partner is RSE.

Web link

http://ib1.org

Innovation Priorities addressed



See in Appendix I the full list of IPs

ICEBREAKER ONE

IB1 Pilot #2

START Q2 2023 — Q2 2026 | 3 M€ | Co-funded | INCO

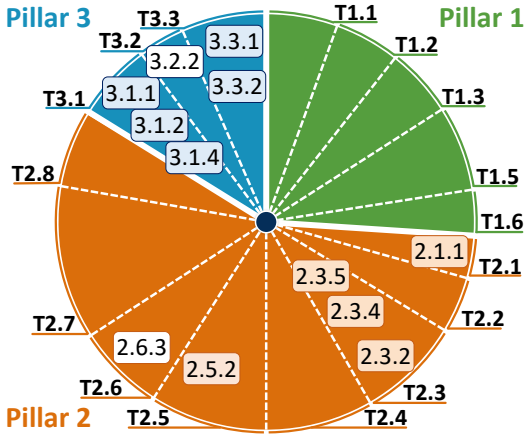
Project name / acronym
Perseus

Project short description
Perseus is developing a whole-of-market solution to create rapidly scalable, low-effort, low-friction carbon and ESG/sustainability reporting. It will help automate access to the raw primary data that is used in reporting, staring with electricity data.
Better access to energy data will help banks, working with solutions vendors, to manage financial incentives (e.g. lower rates) and better manage climate risk and audit on their loan books.
This will unlock net zero investment and make energy efficiency more rewarding for small businesses.
To unlock open markets for net zero innovation in the race to zero, better access to assurable energy data will help catalyse the financial sector to deliver incentives aimed at scale, and create the underlying data infrastructure to enable cross-industry, assurable data sharing while maintaining security and user control.
The 'ignition phase' is gathering experts representing banking, accounting, ledger, energy and SME communities.
Its core innovation is to connect smart meter data directly to the carbon accounting systems, with the permission of the business using the energy.
This will enable assurable data to flow directly from the real economy to the financial economy. The project supports all Pillar 3 objectives.

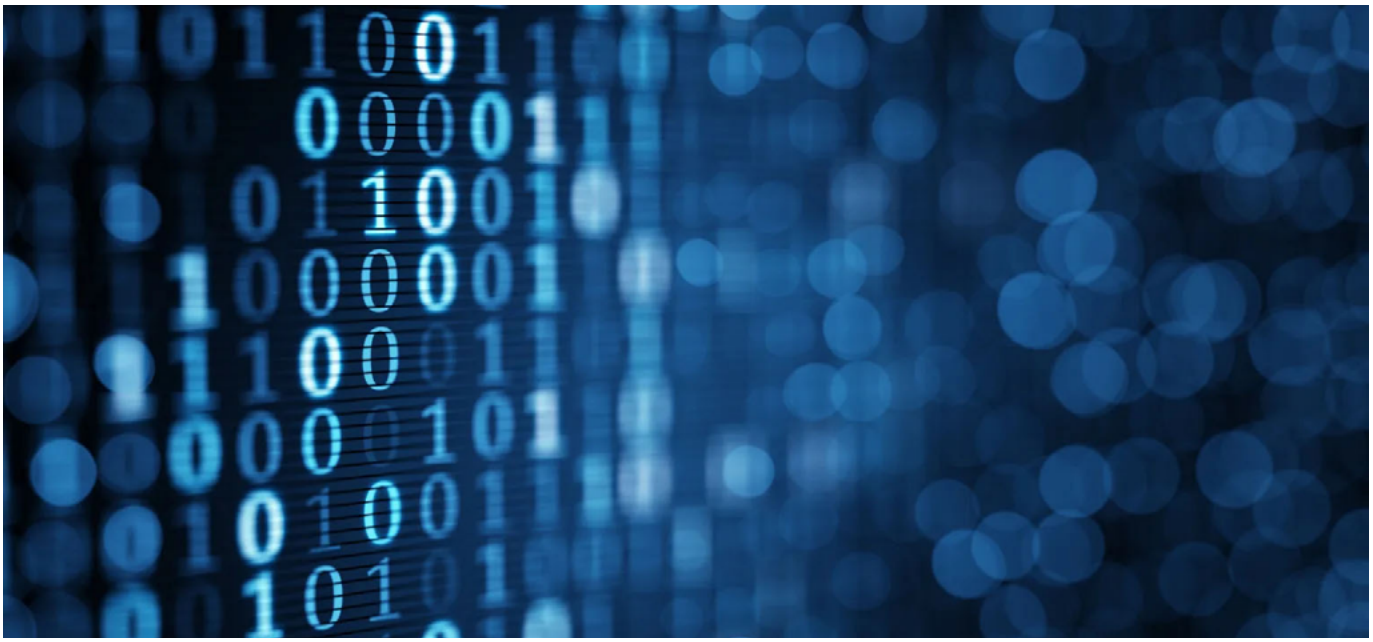
Main involved partners
The initiative is backed by UK Government, over a dozen trade associations representing energy, financial and industry stakeholders, and over a dozen commercial companies who are actively engaged in building a pilot. International observers include OECD, World Energy Council, IIGCC, and the International Chambers of Commerce.

Web link
https://ib1.org/perseus

Innovation Priorities addressed



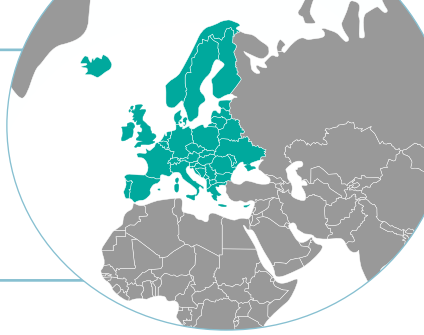
See in Appendix I the full list of IPs



CORE MEMBER

nationalgrid

NATIONAL GRID



Decarbonisation targets

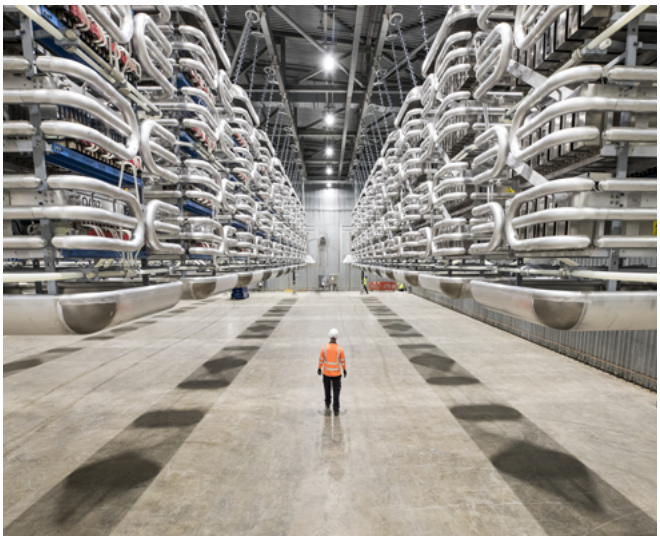
National Grid (NG) is an energy company operating in the UK and US. NG owns high-voltage transmission network in England & Wales and UK's largest electricity distribution network. NG ESO balances GB's energy supply and demand in real time. NG Ventures develops and invests in large scale energy projects.

Decarbonisation goals

National Grid has several decarbonisation goals. It will reduce direct and indirect emissions 80% by 2030, 90% by 2040, and to net zero by 2050 from a 1990 baseline. National Grid will reduce the emissions for the electricity and gas we sell to our customers by 20% by 2030 from a 2016 baseline. A reduction of 50% in SF6 emissions by 2030 as well as transitional all light-duty vehicles to electric and reducing annual air travel by 50% from 2019 benchmark. Also, increase the natural environments on our land by 10%.

Main innovation activity

National Grid main sources of innovation funding are managed by Ofgem. National Grid focuses on several areas of innovation to deal with decarbonisation, decentralisation, digitalisation, and democratisation. A range of projects focusing on different areas such as: zero carbon transition, digital and data transformation, grid investment, whole energy system, future markets and system operability and resilience. Within these areas National Grid aims to develop new smart techniques, improve performance, deliver value for money, and deliver compatible solutions.



National Grid Pilot #1

START Q2 2022 — Q1 2026

1.15 M€ | Public funded

Project name / acronym

Crowdflex

Project short description

CrowdFlex explores how the domestic flexibility can be used in grid operations to help align demand to generation, improve coordination across the network, reduce stress on the system while empowering consumers to be active players in reducing their energy bills via new tariffs and incentives. This aims to establish domestic flexibility as a reliable energy and grid management resource.

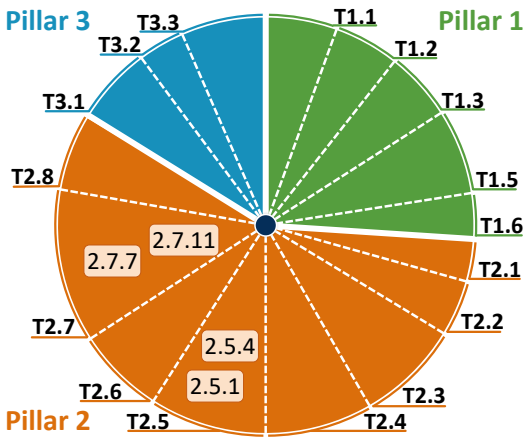
Main involved partners

Octopus Energy (UK), Ohme Technologies (UK), Centre for Net Zero (UK), Element Energy (UK), Scottish and Southern Electricity Networks (UK), National Grid Electricity Distribution (UK)

Web link

https://www.nationalgrideso.com/future-energy/projects/crowdflex

Innovation Priorities addressed

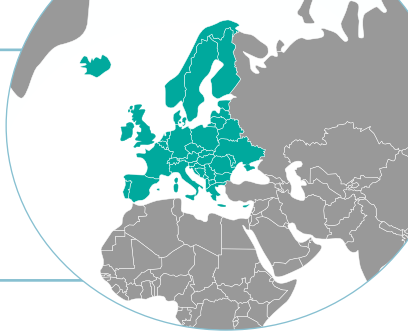


See in Appendix I the full list of IPs

CORE MEMBER

nationalgrid

NATIONAL GRID



National Grid Pilot #2

START Q2 2021 >2026

1.15 M€ Public funded

Project name / acronym

Virtual Energy System

Project short description

Real-time replica of the entire energy landscape (GB) will work in parallel to the physical system.
A shared industry asset, the Virtual Energy System will improve simulation and forecasting abilities to support the long-term vision to operate a zero-carbon electricity system.

At the current stage, develop a scaled demonstrator in a confined geographical area that shows real-world examples in practice.
This innovation project will define a framework, including use case parameters, design governance process, and a proposed technical stack required to share data.

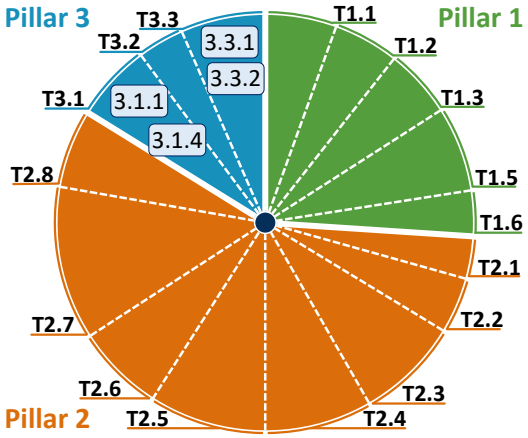
Main involved partners

Arup (UK)

Web link

https://www.nationalgrideso.com/future-energy/virtual-energy-system

Innovation Priorities addressed



See in Appendix I the full list of IPs

National Grid Pilot #3

START Q4 2022 Q1 2024

540 k€ Public funded

Project name / acronym

Commander

Project short description

The Distribution Network Operators (DNOs) and Distribution Energy Resources (DERs) are becoming active participants in providing increasing levels of flexibility to Great Britain's electricity system but there is uncertainty in relation to the roles and responsibilities of the System Operator at transmission level and DSOs in this smart energy world.

This project aims to address those gaps and has the potential to deliver whole systems benefits by creating new flexibility market opportunities for potential service providers.

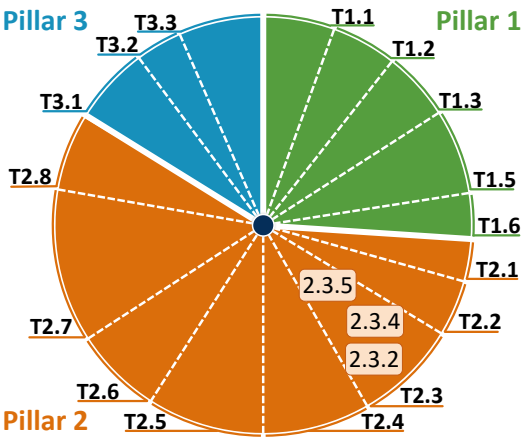
Main involved partners

Arup (UK)

Web link

https://smarter.energynetworks.org/projects/nia2_ngeso012/

Innovation Priorities addressed

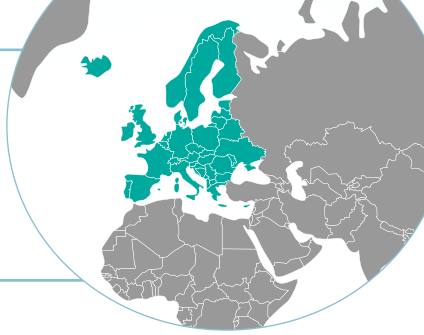


See in Appendix I the full list of IPs

CORE MEMBER

nationalgrid

NATIONAL GRID



National Grid Pilot #4

START Q2 2021

350 k€ | Public funded

Project name / acronym

Stability Market Design

Project short description

The Stability Market design project will consider the current stability arrangements in Great Britain and investigate the best options for an end-to-end market design. The market will be designed to work across three-time frames:

- Short-term Stability Market, the short-term market will help meet more dynamic needs for stability working a Day ahead.
- Mid-Term Stability Market, recognising there are certain needs will need longer solutions for stability services the Mid-term market works by looking a year ahead and offers yearly contracts to cover long term.
- Long-term Stability Market, setting up the long-term stability market to work 4 years ahead to cover longer term needs when the need arises.

This allows the system operator a rout to access stability services through an open, transparent and competitive market and is anticipated that the benefits of this market will be approximately £58 million by 2030.

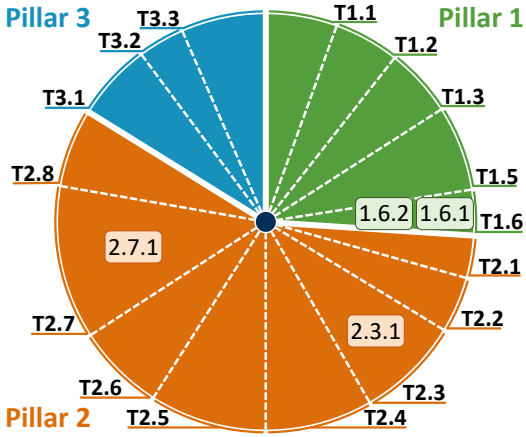
Main involved partners

Afry (UK)

Web link

https://www.nationalgrideso.com/future-energy/projects/stability-market-design

Innovation Priorities addressed



See in Appendix I the full list of IPs

National Grid Pilot #5

START Q1 2022 — Q4 2025

17.7 M€ | Public funded

Project name / acronym

EQUINOX

Project short description

EQUINOX will be dedicated to addressing the challenges Distribution Network Operators (DNOs) face with the electrification of heat. The project is developing novel commercial arrangements and supporting technologies that will unlock flexibility from residential low carbon heating while meeting the needs of all consumers and the fuel for the poor and vulnerable.

Equinox is developing three novel commercial methods to maximise participation in domestic DNOs flexibility services. These methods will demonstrate how varying risk/reward frameworks between DNO's, suppliers and customers can influence the amount, cost and reliability of flexibility form portfolios for varying customer segments including poor and vulnerable.

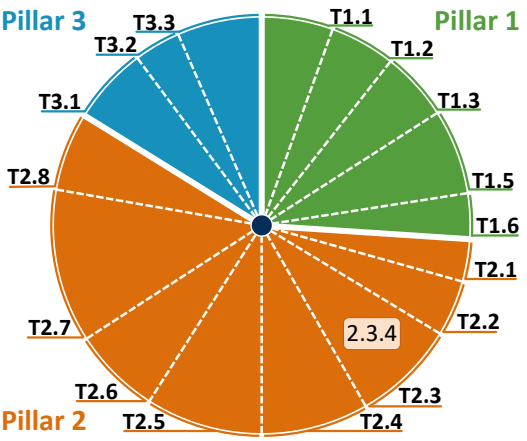
Main involved partners

SP Energy Networks (SPEN) (UK), Octopus Energy (UK), PassivUK (UK), Welsh Government (UK), West Midlands Combined Authority (WMCA) (UK), Sero (UK), Guidehouse (UK)

Web link

https://www.nationalgrid.co.uk/innovation/projects/equinox-equitable-novel-flexibility-exchange

Innovation Priorities addressed



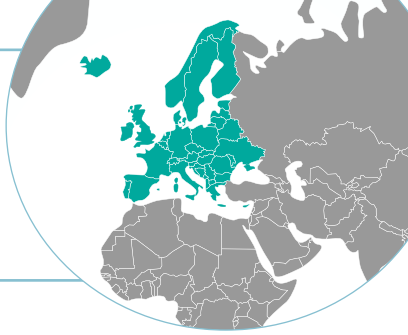
See in Appendix I the full list of IPs

GREEN POWERED FUTURE MISSION

CORE MEMBER

nationalgrid

NATIONAL GRID



National Grid Pilot #6

START Q4 2021 — Q1 2024

2.1 M€ | Public funded

Project name / acronym

Pre-Fix

Project short description

Pre-Fix will develop and demonstrate a Common Disturbance information Platform (C-DIP), allowing equipment from different vendors to be utilised for pre-fault detection and more accurate fault location on High Voltage overhead line and underground cable circuits.
It will also demonstrate how certain existing network devices such as protection relays, power quality monitors and low voltage monitors might also help contribute to high voltage pre-fault detection in additional to their base function. Furthermore, it will show how consistent operational dashboards and reports are able to be developed from this platform to enable a consistent policy-driven approach to be implemented across an organisation. The outcomes of this project are expected to deliver game-changing performance benefits for the operation of distribution systems across Great Britain.

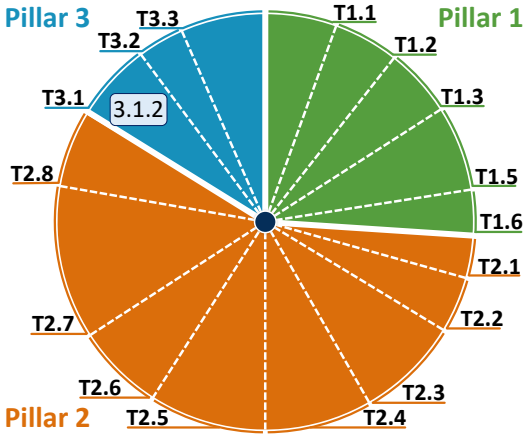
Main involved partners

Nortech (UK) with consultation from equipment supplier parties

Web link

https://www.nationalgrid.co.uk/innovation/projects/pre-fix

Innovation Priorities addressed



See in Appendix I the full list of IPs

National Grid Pilot #7

START Q4 2022 — Q4 2023

1 M€ | Public funded

Project name / acronym

System value from V2G peak reduction in future scenarios based on strategic transport and energy demand modelling

Project short description

This project will develop a strategic transport and energy demand model using transport demand modelling techniques (considering consumer behaviour, infrastructure constraints, and battery degradation) and a whole-energy simulator to investigate the impacts of V2G on electricity peak demand across the entire GB system under different credible decarbonisation scenarios. The model will develop profiles for electricity demand from domestic vehicles to 2035 and 2050. This modelling framework will be used to quantify the 'option value' of flexibility from smart charging and V2G to identify cost-effective expansion strategies for the GB transmission network. This will give a better understanding of V2G and help understand its potential to reduce the peak demand on the network and identify the impact of different parameters on the success of V2G.

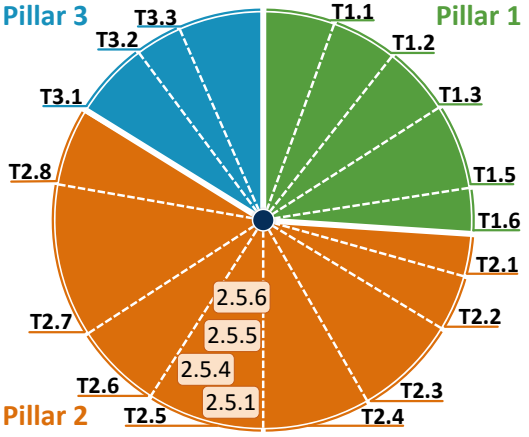
Main involved partners

National Grid Electricity Transmission (UK), National Grid Electricity System Operator (UK), Frontier Economics (UK), Imperial College (UK), Warwick University (UK)

Web link

https://smarter.energynetworks.org/projects/nia2_nget0017

Innovation Priorities addressed

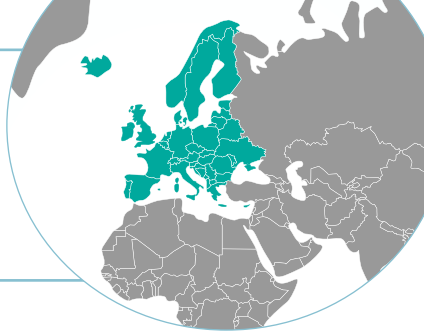


See in Appendix I the full list of IPs

CORE MEMBER

nationalgrid

NATIONAL GRID



National Grid Pilot #8

START Q2 2022 — Q3 2023

370 k€ | Private funded

Project name / acronym

Role and value of electrolysers in low carbon GB energy system

Project short description

This project aims to analyse the benefits of linking electricity and hydrogen vectors to determine the optimum capacity, location, technologies, and system benefits of electrolysers under different future development scenarios. The impact of power-to-gas on the whole energy system, particularly on the electricity transmission network operation and development will be investigated. The project will develop an integrated whole system model to optimise the portfolio and locations of electrolysers considering several factors such as system constraints, end-use application of hydrogen, and hydrogen transportation costs.
The expected benefits of this project for the consumer are low cost for decarbonisation of the electrical power system, transport, and heat sectors, collectively.

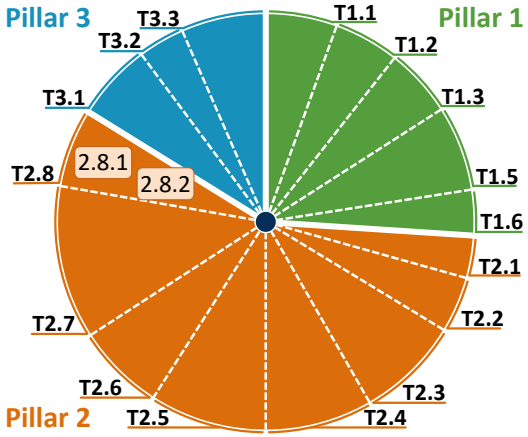
Main involved partners

National Grid Electricity Transmission (UK), National Grid Electricity System Operator (UK), National Grid Gas Transmission (UK), Imperial College (UK)

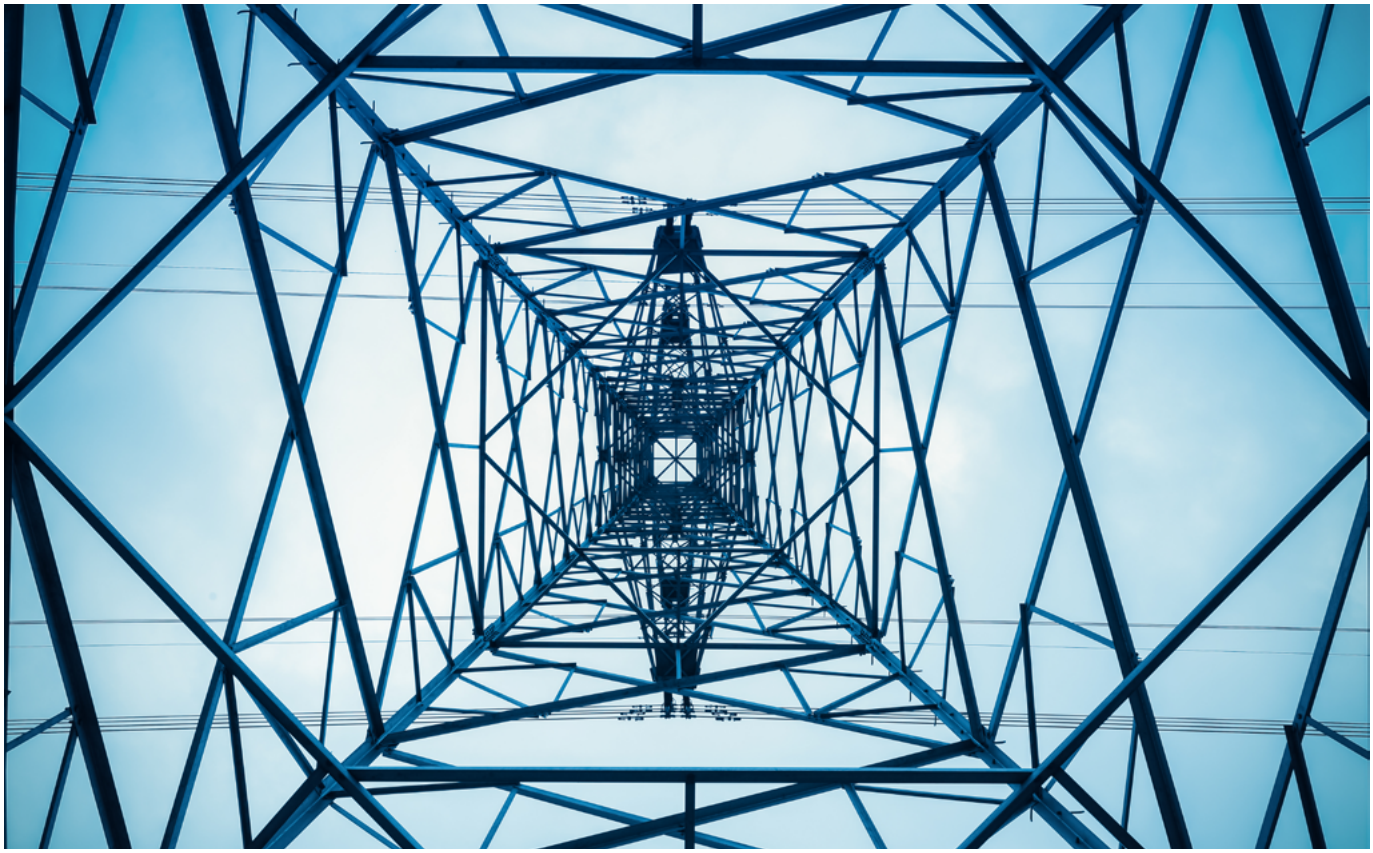
Web link

https://smarter.energynetworks.org/projects/nia2_nget0002

Innovation Priorities addressed

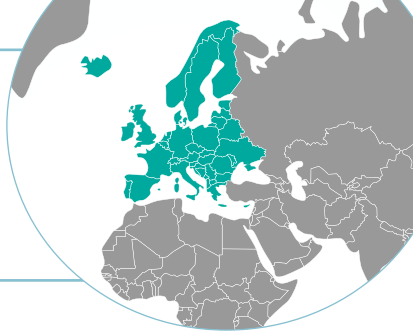


See in Appendix I the full list of IPs



SUPPORT MEMBER

TERNA



Involved Sector

As Transmission System Operator, Terna has to design a grid capable of handling the progressive decarbonisation of the sources of production and the growing integration of renewables, whilst guaranteeing that, at all times, energy demand is always balanced by the amount produced through dispatching.

Decarbonisation goals

Terna is reinforcing its commitment to fight climate change thanks to the definition of new targets to reduce greenhouse gas emissions arising from its direct and indirect activities. The company has adopted a new Science-Based Target (SBT) through which it undertakes to cut by 2030 its CO_2 emissions by 46%, compared to 2019, improving the previous target that called for a reduction in climate-altering emissions by around 30%.

Main innovation activity

Our innovation is divided into Open Innovation Initiatives and Innovation Projects.
The process starts by pinpointing innovation needs, identifying trends and enabling technologies. The preparation and development of ideas happen both in-house and externally through collaboration with universities and start-ups and also through technology scouting. The most promising solutions are taken beyond experimental level and are developed as projects by the "innovation factories".

TERNA Pilot #1

START Q1 2022 — Q1 2025

Private funded | INCO

Project name / acronym

Grid Forming

Project short description

The project aims at implementing and testing Grid Forming control in the Control System of a storage plant. Grid Forming is an innovative control strategy that allows inverter-based resources (like batteries, wind and photovoltaic generators) to mimic some behaviours of traditional thermal generators (i.e. inertia and short-circuit power), in order to enhance grid stability even in case of high inverter-based penetrations. In relation to maintaining safe operation on HV grids, the main problems are due to the inability of such systems to impose the required voltage and current values regardless of the state of the network parameters, as well as to inherently provide inertia and short-circuit power.
Thanks to these projects, it could be possible to verify real performances of the control, to formulate future technological scenarios and to plan normative updates. In 2023 Terna aim at implementing and installing the Grid Forming control, to be tested during 2024.

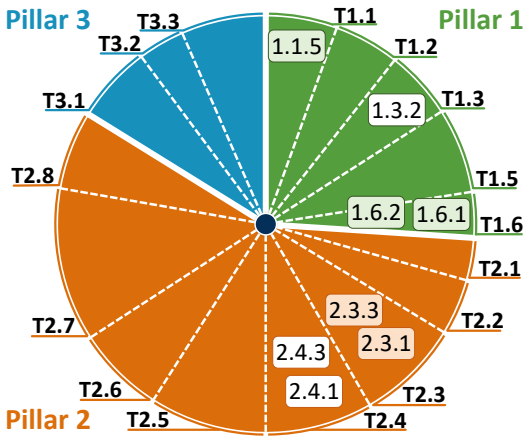
Main involved partners

Other TSOs, inverter constructors, RES plants Operators

Web link

https://www.terna.it/it/sistema-elettrico/innovazione-sistema

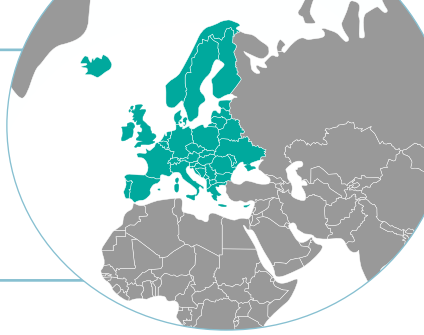
Innovation Priorities addressed



See in Appendix I the full list of IPs

SUPPORT MEMBER

TERNA



TERNA Pilot #2

START Q1 2022 — Q1 2024

Private funded | INCO

Project name / acronym

Industrial DSR potential assessment

Project short description

Flexibility from industrial Demand Side Response is potentially very high, however the upgrade activities and the tests showed how challenging can be to actually extract flexibility, especially for faster services. The project aims to analyse and demonstrate more in depth the actual flexibility potential of - in particular - "hard to abate" and energy intensive industrial sectors (steel mills, refineries, paper mills, etc.) and, more specifically, data centres, for which are expected a significant growth in electric power consumption. This latter trend could be seen as a challenge for the electric transmission grid, at national and European level. Flexibility assessment, through demonstration activities together with the main players of each sector, will allow formulate guidelines to increase the synergy between DSR and electricity market needs.

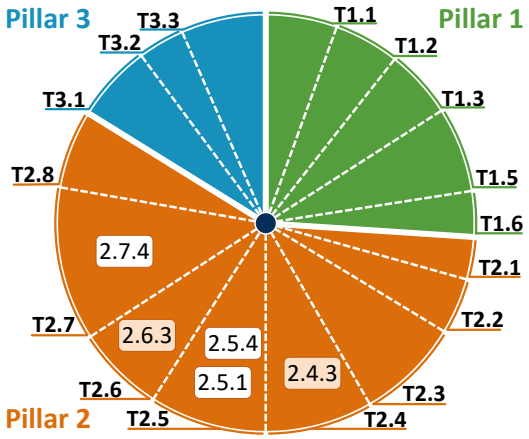
Main involved partners

Industrial Plants, Data Centres Operators and constructors

Web link

https://www.terna.it/it/sistema-elettrico/innovazione-sistema

Innovation Priorities addressed



See in Appendix I the full list of IPs

TERNA Pilot #3

START Q4 2020 — Q4 2027

Co-funded | INCO

Project name / acronym

EQUIGY - Crowd Balancing Platform

Project short description

Equigy creates a trusted data exchange to enable aggregators to participate with smaller flexibility devices, such as home batteries and electric vehicles, in electricity balancing markets, turning consumers into prosumers.

The Crowd Balancing Platform (CBP) is a blockchain-based system to share relevant information between the participating parties in a transaction – such as TSOs, DSOs, Aggregators, Original Equipment Manifacturers and data providers – in a trusted and secured way. The CBP facilitates the data exchange using ENTSO-E (European Network of Transmission System Operators for Electricity) and eBIX standards for registration, bidding, activation and measurement of flexibility transactions from aggregators of distributed energy resources (DERs). The CBP enables the proof of delivery of flexibility transactions, while allowing the market to operate within grid limits.

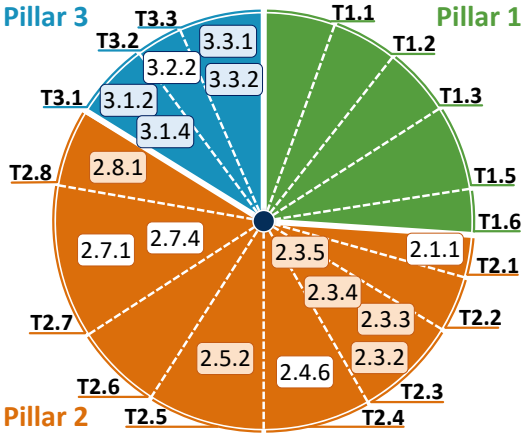
Main involved partners

European TSOs, DSOs, Aggregators, O&Ms

Web link

https://equigy.com/

Innovation Priorities addressed



See in Appendix I the full list of IPs

SUPPORT MEMBER

TERNA

TERNA Pilot #4

START Q1 2023

Co-funded | INCO

Project name / acronym

Wind Offshore Impact Assessment

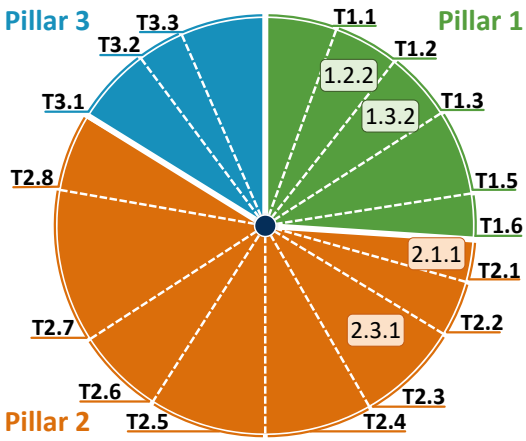
Project short description

The project aims to evaluate the impacts of offshore wind cutting on grid stability, taking into account the big amount of wind power plant expected to be connected to HV grid in the next decade. In a first stage, will be performed a study, through grid simulations, to quantify the impacts of offshore wind on grid stability and market ancillary services, in future scenarios (e.g. in case of loss of large wind farms), with a focus on Sicily and Sardinia. In parallel, technical insights in close contact with R&D manufacturers of wind farms will be performed, in order to trace the state of the art and perspectives on the potential of the latest generation wind turbines. The final goal will be to identify technical and operational requirements for offshore installations and real-time management methods, aimed at mitigating instability phenomena.

Web link

https://www.terna.it/it/sistema-elettrico/innovazione-sistema

Innovation Priorities addressed



See in Appendix I the full list of IPs

2.3

N&S AMERICAN AND AUSTRALIAN NATIONAL PILOTS

This section introduces GPFM North & South American and Australian coalition members decarbonization strategy and reports on National Pilot projects fully aligned with the identified Innovation Priorities

CORE MEMBER

AUSTRALIA

Decarbonisation targets

In June 2022, Australia increased its emission reduction ambition and committed to reducing its greenhouse gas emissions by 43% below 2005 levels by 2030 and achieving net zero emissions by 2050. The Climate Change Bill was passed in September 2022 and is now law.

Australia's 2030 target is both a single year commitment to reduce emissions by 43% by 2030 (to 354 Mt CO_2 equivalent), and a multi-year emissions budget covering cumulative emissions from 2021-2030 (a total of 4,381 Mt CO_2 equivalent over this period).

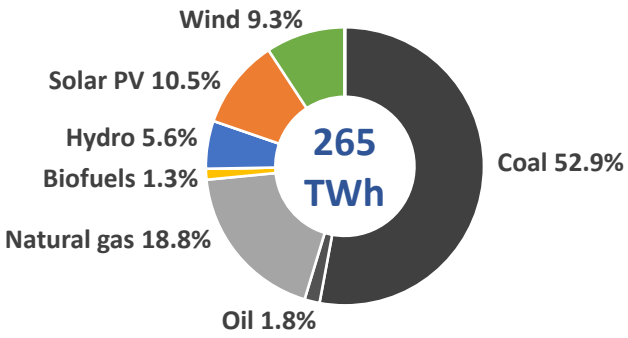
Main innovation activities

The Australian Renewable Energy Agency (ARENA), supports Australian researchers, innovators and businesses to solve key national challenges, with priority to:

- Optimise the transition to renewable electricity
- Commercialise clean hydrogen
- Support the transition to low emissions metals
- Decarbonise land transport.

As Australia moves to a lower-cost renewable electricity based system, innovation is sought that will:

- Enable ultra low-cost renewable generation
- Improve the economics of energy storage
- Optimise integration of large-scale renewable energy into the electricity system
- Support flexible demand.



Electricity generation mix (IEA data 2021)

Australia Pilot #1

Project name / acronym

South Australia's Clean Energy Transformation

Project short description

Over the past 15 years, South Australia has transformed from 0% to 68% renewables, exiting coal fired generation, and successfully integrating a world leading share of variable renewables and rooftop solar.

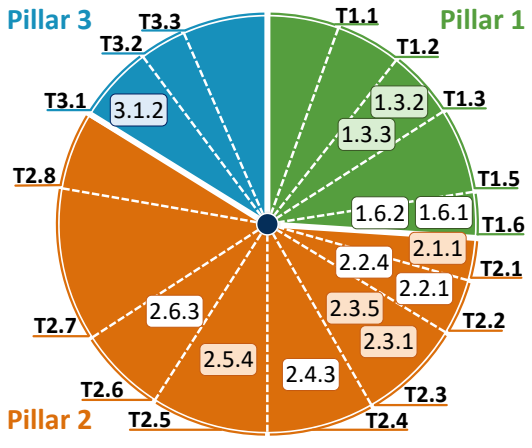
South Australia's clean energy transformation project will provide a case study of the technical, social & regulatory challenges and lessons learned as this GW scale system moves to 100% renewable energy operation and positioning South Australia towards becoming a renewable energy exporter.

This large-scale demonstration will focus on operational experiences of the South Australian electricity region, connected to the main Australian grid (the National Electricity Market, NEM). These experiences will be coupled with results from other pilots and research to guide efforts to progress the key Australian research challenges, including supporting very high levels of distributed renewables; the capability of distributed resources to contribute to electricity system services; and the system architectures to support these changes.

Main involved partners

CSIRO, AEMO, SA Government, SA Power Networks

Innovation Priorities addressed



See in Appendix I the full list of IPs

SUPPORT MEMBER

BRAZIL

Decarbonisation targets

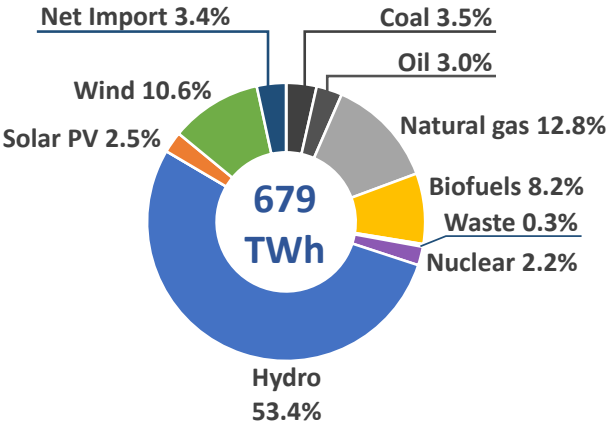
Brazil has one of the cleanest energy mixes in the world, with a share of 48.4% of renewables in the energy sector and 84.8% in the electricity mix, nonetheless, Brazil has also made significant investments in solar and wind energy and biomass, which, in 2021, accounted for 20% of the country´s energy mix and still are experiencing rapid growth.

Nevertheless, Brazil has an economy-wide target to reduce greenhouse gas emissions by 37% in 2025, and by 50% in 2030 (compared to 2005 levels).

Main innovation activities

Despite the high share of renewables in the main grid, in the isolated system the situation is different, as an attempt to address this situation, in 2014, the Ministry of Mines and Energy (MME) implanted the energy auction to purchase energy from Independent Power Producers (IPPs), those auctions included benefits for renewable-based solution, like longer Power Purchase Agreements (PPAs).

Moreover, in 2022 the government launched a program for reducing costs in electricity generation in the Amazon region, and according to the regulation, the projects should aim at economic efficiency, by the use of local energy resources and reducing environmental impacts.



Electricity generation mix and net import (IEA data 2021)

Brazil Pilot #1

Project name / acronym

Hybridization of Isolated Systems in Brazil

Project short description

Most of the Isolated Systems in Brazil (212 in total) are placed in the Amazon region and are made up of both small communities (less than 100 kW in peak demand) and cities (up to 20.000 kW) in which more than 90% of the generation comes from fossil fuels, in spite of recent initiatives and studies showing the technical feasibility of hybrid solutions. Because of that, a pilot project deployment is desirable to prove the reliability of renewables and the cost-effective solution for electric generation in isolated systems.

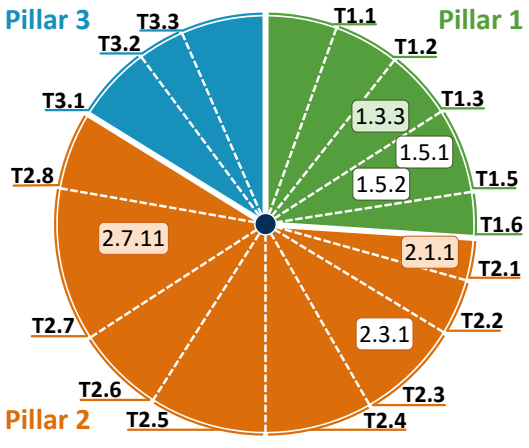
For this project, EPE suggests selecting places where diesel is still the only source for generation like Coari (19.300 kW); Tabatinga (13.500 kW); and Tefé (20.000 kW), all in Amazonas State (AM), any of which are good options to receive the demo project.

It is desirable that the demo project phase out diesel power plants generation by replacing it with biofuels, solar PV with batteries, or other renewable-based projects.

Main involved partners

EPE (BR), MME (BR), local IPP, Amazonas Energia (DSO), Financial Institutions, BNDES (National Development Bank), Eletrobras

Innovation Priorities addressed



See in Appendix I the full list of IPs

SUPPORT MEMBER

CANADA

Decarbonisation targets

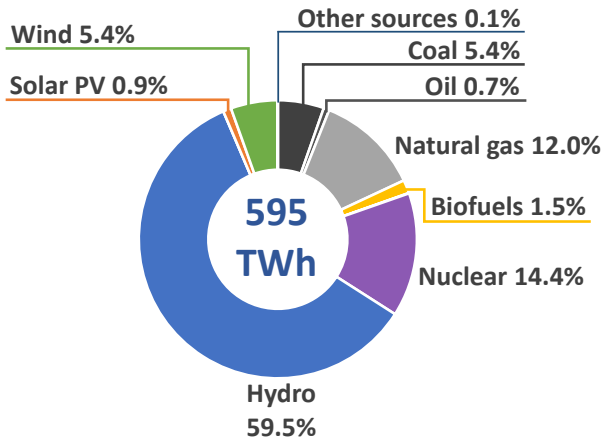
In March 2022, the Government of Canada released the 2030 Emissions Reduction Plan, an ambitious and achievable sector-by-sector pathway for Canada to reach its emissions reduction target of 40% below 2005 levels by 2030 and net-zero emissions by 2050. Canada is also committed to achieving a net-zero electricity grid by 2035. Canada is working to address climate change and achieve these goals by bringing together innovation from across the financial sector, businesses, and communities.

Main innovation activities

Clean energy innovation is a cross-cutting priority that underpins Canada's efforts to achieve climate and energy goals and influence the pace and direction of energy systems transformation. The Government of Canada continues to drive innovation by providing funding to trial pre-commercial clean technologies and de-risk large-scale pilot projects critical to net-zero transitions. Canada is advancing work in the smart energy systems space to address key priorities, including for renewable energy integration, grid modernization, energy storage, and regulatory/market innovation

Note on the Canadian national Pilots

Canada is committed to contributing to the "5 demos in five continents" sprint. Canada's 2023 Federal Budget announced new measures to support electricity grid innovation, including the renewal of the Smart Grid Program. Natural Resources Canada (NRCan) is working to develop dedicated supports to launch new smart grid pilot projects. These are expected to be strongly aligned with the GPFM priorities. Until information on new projects is available, NRCan will share information on previously funded projects strongly aligned with the GPFM's goals.



Electricity generation mix (IEA data 2021)

Canada Pilot #1

START Q1 2018 — Q1 2022

11 M€ | Co-funded

Project name / acronym

Saint John Energy - Integrated Dispatchable Resource Network for Local Electric Distribution Utility

Project short description

Saint John Energy is using machine learning and data analytics in a system of load prediction algorithms to optimize the dispatch of various Distributed Energy Resources (DERs) on the local electrical grid. The integration of DERs such as electrical energy storage devices, thermal energy storage devices, and load control elements allow Saint John Energy to shape the load profile and more effectively utilize the available capacity of the local electrical network. The Project was recognized as the winner of the 2021 Award of Excellence from ISGAN for the theme "Excellence in Smart Grids for Future Proofing the Grid Operation via Advanced Digitalisation & IoT".

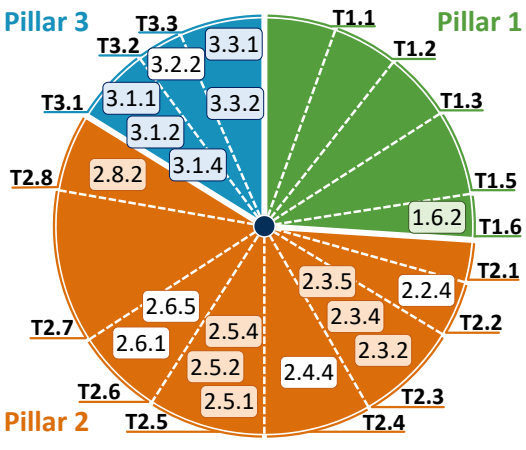
Main involved partners

NRCan (CA), Saint John Energy (CA), City of Saint John (CA), Stash Energy (CA), University of New Brunswick (CA), Natural Sciences and Engineering Research Council of Canada (CA), Open Systems International (US), Atlantic Canada Opportunities Agency (CA)

Web link

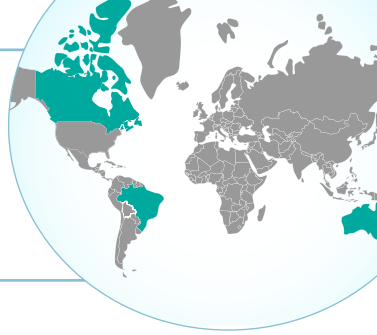
https://www.nrcan.gc.ca/science-and-data/funding-partnershIPs/funding-opportunities/current-investments/integrated-dispatchable-resource-network-for-local-electric-distribution-utility/21687

Innovation Priorities addressed



See in Appendix I the full list of IPs

SUPPORT MEMBER



CANADA

Canada Pilot #2

START Q1 2018 — Q1 2023

4 M€ | Co-funded

Project name / acronym

ENMAX Power - Integrating Distributed Generation into Secondary Networks in Large Urban Centres

Project short description

The objective of this project is to develop and demonstrate a new solution to accommodate bi-directional power flows on urban meshed electrical grids which use a secondary network whose network protection scheme has the unintended effect of preventing the backflow/ reverse flow of distributed generation. This can ultimately help unlock the untapped potential for urban centers, such as the city of Calgary, to allow generation from renewable and distributed energy. Initially, this will be demonstrated using Solar Photovoltaics (PV) but can be expanded to include other types of generation and resources. The success of this project could lead to significant reductions of GHGs and result in many other benefits.

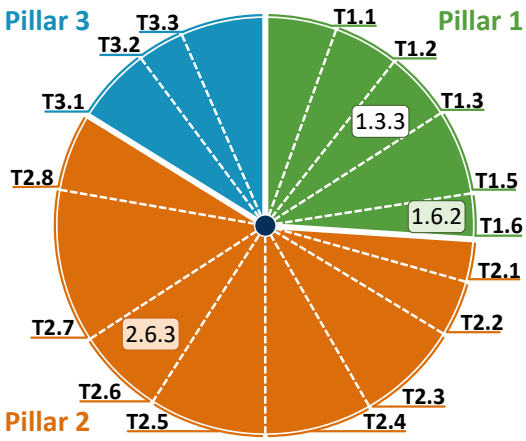
Main involved partners

NRCan (CA), EMMAX Power (CA), Cadilac Fairview (CA), Alberta Innovates (CA)

Web link

https://www.nrcan.gc.ca/science-and-data/funding-partnerships/funding-opportunities/current-investments/integrating-distributed-generation-secondary-networks-large-urban-centres/21322

Innovation Priorities addressed



See in Appendix I the full list of IPs

Canada Pilot #3

START Q1 2018 — Q1 2022

7.7 M€ | Co-funded

Project name / acronym

London Hydro - West 5 Smart Grid Project

Project short description

This project will involve the following innovations:

1) microgeneration;
2) renewable sources of energy;
3) tighter building envelopes;
4) smarter heating and cooling systems;
5) direct current (DC) generation, distribution, and energy storage;
6) system monitoring;
7) vehicle-to-grid storage; and
8) improved electric vehicle (EV) charging infrastructure.

The overarching objective of the project is to successfully construct Canada's first large-scale, fully integrated, net-zero energy community, to demonstrate net-zero energy's feasibility, deploy it at the community level, and to inspire and inform widespread change across Canada's construction industry towards net-zero energy.

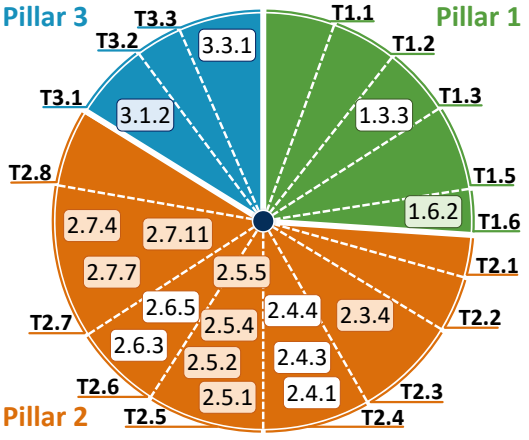
Main involved partners

NRCan (CA), London Hydro (CA), S2e Technologies (CA), Sifton Properties Ltd. (CA), Western University (CA)

Web link

https://www.nrcan.gc.ca/science-and-data/funding-partnerships/funding-opportunities/current-investments/west-5-smart-grid-project/22880

Innovation Priorities addressed

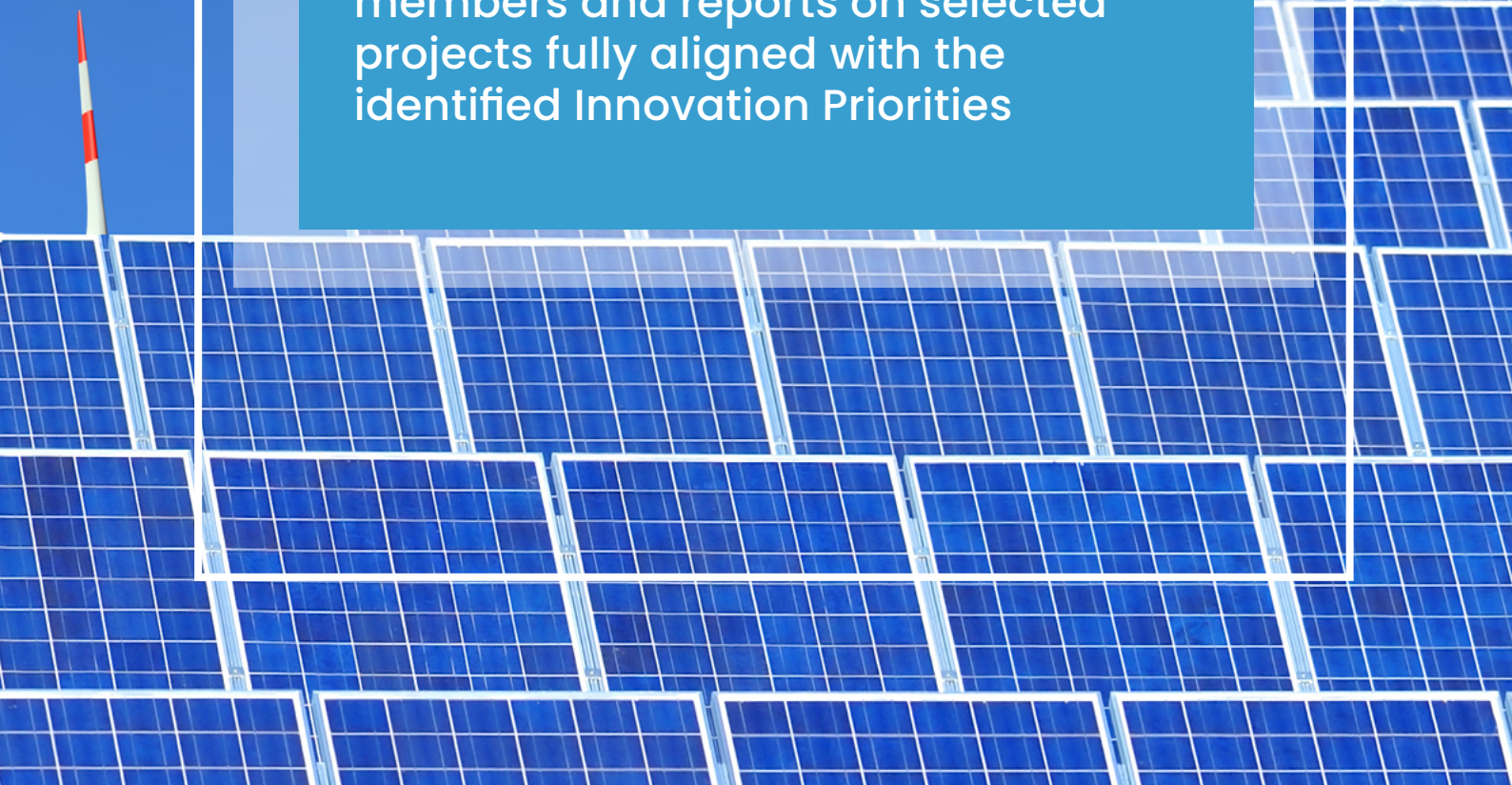


See in Appendix I the full list of IPs

"A massive scaling-up and speeding-up of **renewable energy across power generation, industry, buildings and transport** will reduce energy prices over time and decrease the countries' dependence on fossil fuels."

2.4 INTERNATIONAL ORGANIZATION PILOTS

This section introduces GPFM International Organisation coalition members and reports on selected projects fully aligned with the identified Innovation Priorities



SUPPORT MEMBER

INTERNATIONAL ENERGY AGENCY

Involved Sector

The IEA is at the heart of global dialogue on energy, providing authoritative analysis, data, policy recommendations, and real-world solutions to help countries provide secure and sustainable energy for all. Taking an all-fuels, all-technology approach, the IEA recommends policies that enhance the reliability, affordability and sustainability of energy. It examines the full spectrum issues including renewables, oil, gas and coal supply and demand, energy efficiency, clean energy technologies, electricity systems and markets, access to energy, demand-side management.

Decarbonisation goals

The IEA develops analysis and policy guidance to support decarbonisation efforts in the energy sector. In 2023, the IEA published Net Zero by 2050 – A Roadmap for the Global Energy Sector. IEA publishes annual updates on clean energy technology deployment. The Digital Demand Driven Electricity Networks (3DEN) initiative supported by the Italian government, provides analysis, policy guidance, peer-to-peer exchange on power system decarbonisation and resilience through digitalisation.

Main innovation activity

The IEA tracks energy research, innovation and demonstration activities and provides insights and guidance to support clean energy innovation and deployment.
In the Clean Energy Technology Guide, the IEA monitors progress of 500+ key clean energy technologies that can contribute to achieving net zero CO_2 emissions by 2050. The sample includes about 70 technologies in the power sector as of 2023. The Guide also includes a Clean Energy Demonstration Projects Database, launched for the first time in 2022, which aims to track global efforts to demonstrate key technologies at the project level. In 2022, the IEA estimated that at least USD 90 billion of public funding needs to be raised by 2026 to complete a portfolio of demonstration projects for technologies that could be commercially ready by 2030.

IEA Pilot #1

Project name / acronym

3DEN Initiative

Project short description

As part of the IEA 3DEN Initiative implementation phase, the Italian government together with the United Nations Environment Programme (UNEP) launched a smart grid pilots programme. The selected pilot projects to be implemented are located in:

- Brazil: "Digital Districts for Flexible Energy Services", to empower residents to play an active role in optimising energy demand and provide services to the electricity system.
- Colombia: "Enelflex", a demand response mechanism to alleviate grid congestion and associated disconnections.
- India: "Digital Twin for Enhanced Electric Distribution Grid Operation and Management", to develop solutions to improve reliability and cost-effectiveness of distribution networks.
- Morocco: "Transformation of Global Energy Systems in Food and Drink Processing Companies", to reduce energy demand by 36% by 2030 and provide support to power systems.

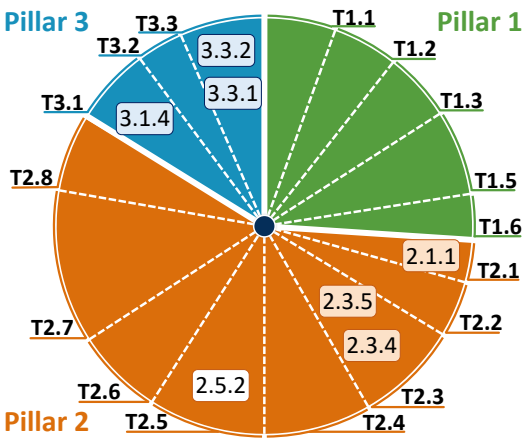
Main involved partners

- Brazil: Planet Smart City with EoT
- Colombia: Enel Grids, Enel Gridspertise, Condensa and Politecnico di Milano
- India: Panitek Power, BSES Rajdhani Power Limited, Venios and the Energy and Resources Institute (TERI)
- Morocco: Les Eaux Minerales d'Oulmes (LEMO) with Global Quality Consulting, Elexpert, SACMI Beverage and l'Association Marocaine des Boissons

Web link

https://www.iea.org/programmes/digital-demand-driven-electricity-networks-initiative

Innovation Priorities addressed



See in Appendix I the full list of IPs

CORE MEMBER

IRENA
International Renewable Energy Agency

IRENA

Involved Sector

IRENA with its global membership and mandate takes the leading role in accelerating the global, renewables-based, energy transition to fight climate change and drive an urgent and systemic shift for increased energy access, reduced inequalities, improved energy security and prosperous and resilient economies and societies.

Decarbonisation goals

Annual IRENA's World Energy Transition Outlook outlines decarbonization pathways under the Planned Energy and the 1.5°C Scenarios and takes stock of progress achieved.
IRENA undertakes further analysis at global, regional and national levels, develops energy models and tools for planning, flexibility and grid assessments, helps to build national capacities and mobilise funding and provides policy guidance to support countries in redesigning and strengthening their energy systems to decarbonize the energy and end-use sectors.

Main innovation activity

IRENA embraces a systemic innovation approach that matches and leverages synergies in innovations in all parts of the system and includes all relevant actors and stakeholders to successfully implement solutions on the ground. It combines technology innovation (generation & enabling technologies including digitalisation) with innovation in market design, system operation and business models. IRENA further provides innovation toolboxes to help countries design their own solutions to integrate high shares of renewables in the power systems and create their own strategy for smart electrification of end-use sectors.
IRENA tracks progress in energy technology development through indicators such as costs, patents and standards and provides insights to MI Insights Module.
IRENA organises biennial Innovation Weeks (2023) to share insights from all its work and bring together private and public sector experts to discuss cutting-edge innovations.

IRENA Project #1

Project name / acronym

Innovation landscape for smart electrification
Decarbonising end-use sectors with renewable power

Project short description

In order to achieve the collective goal to secure a carbon-neutral future, the global energy transition focuses not only on how energy is produced but also, importantly, on how it is consumed; both supply and demand must be simultaneously transformed to deliver the efficient and effective decarbonisation of the entire system. Innovation in end-use sectors is therefore integral to the transition.
On the supply side, wind and solar technologies have experienced rapid growth in recent years, making substantial amounts of clean electricity available to power systems; IRENA's 2019 report, Innovation landscape for a renewable-powered future, mapped 30 key innovations for integrating high shares of variable renewable electricity in power systems. However, the demand side has not evolved in parallel. Today, the transport and heating sectors continue to largely rely on fossil fuels; yet, both direct and indirect electrification with renewable power now provide feasible solutions to electrify many end-use sectors, thanks to the sharp cost reductions for wind and solar technologies.
This new edition of IRENA's Innovation Landscape provides an innovation toolbox, including 100 innovations that countries can use in tailored national strategies to decarbonize end-use sectors. The report offers pathways to end-use electrification in the areas of power to mobility; power to heat and cooling; and power to hydrogen. The innovation toolbox aims to help decision-makers adopt a systemic innovation approach, combining innovations in technology and infrastructure with those in market design and regulation, system planning and operation, and business models. Even more this work aims to help policy makers identify blind spots, which if overlooked, can hinder the success of smart electrification strategies for the decarbonisation of energy systems. The landscape is also accompanied with more than 60 successful examples of real projects on how to implement actions to make progress on the smart electrification pathway. All in all, this innovation toolbox aims to inform the climate process about emerging key innovations that policymakers can tap into to support the end-use sector decarbonisation with renewables.

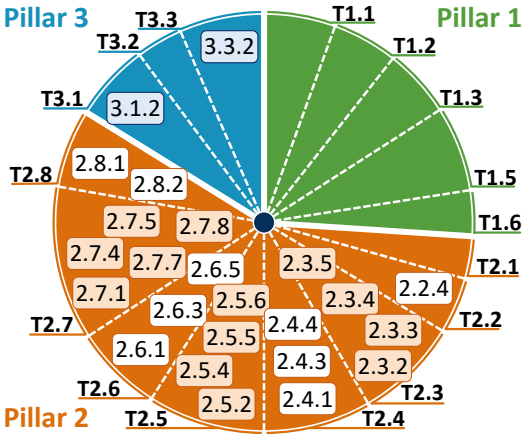
Main involved partners

IRENA is grateful for the support received for the production of this report from the Ministry of Economy, Trade and Industry (METI) of the Government of Japan, and the Ministry of Foreign Affairs (MFA) of the Government of Norway. For the development of the study, IRENA collected input and feedback from a network of more than 150 external experts from industry, academia and governments, with a balanced representation across the globe.

Web link

https://www.irena.org/Publications/2023/Jun/Innovation-landscape-for-smart-electrification

Innovation Priorities addressed



See in Appendix I the full list of IPs

"We must embrace a systemic approach to renewable energy deployment, including a clear focus on **flexible, interconnected, balanced power grids, efficiency solutions, long term energy storage, green hydrogen,** and numerous supporting technologies."

CONTINENTAL TASK FORCES

To allow for the needed level of coordination among National Pilots and move forward with the implementation of Flagship Project 1, GPFM has launched **3 Continental Task Forces** to map out the specific innovation priorities addressed by each national pilot, monitor their progress, and collect main learning and results as soon as pilot projects start their dissemination phase.

The 3 Continental Task Forces mentioned above are the following:

- **Task Force I Asia:** co-led by China & India and involving Japan and the Republic of Korea, plus LONGi and Goldwind from China
- **Task Force II Europe:** co-led by Spain & Italy and involving Austria, Germany, and the UK, plus Alperia, Areti, Enel Grids, GSE and TERNA from Italy and BSI, ENA, IB1, and National Grid from UK
- **Task Force III N.&S. America and Australia:** co-led by Australia & Italy and involving Brazil and Canada

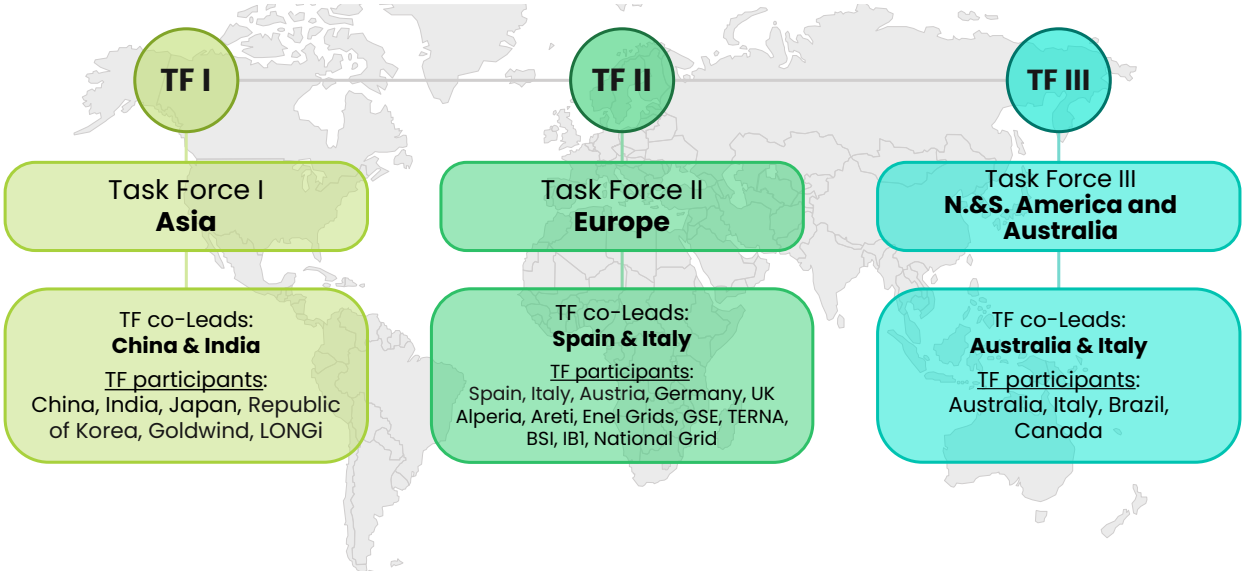
Each Continental Task Force is committed to engage with the coordinators and the main public and private partners of the national pilots in their continental territory in order to:

- **Monitor** the national pilots progress and analyze the main results related to the different Innovation Priorities covered, innovative solutions and best practices in view of their further dissemination and possible broad replication
- **Ensure an effective sharing** of pilot projects' results as well as to leverage existing synergies and/or develop strong complementarity.

In particular each Task Force will foster:

- **High complementarity** among the different national pilots in terms of addressed Innovation Priorities (IPs) thus maximizing the chances to cover all identified IPs.
- **Strong synergy** - the same IP will be tackled by more than one pilot project; this will allow to either compare and analyze alternatives or similar solutions, but in different grid contexts and/or geographies.
- **Extensive replicability** – GPFM will ensure that national pilots will validate innovative solutions with a high degree of replicability, promoting applications of the validated solutions in different geographies and climates. Validated innovative solutions and main outcomes will populate a "Toolbox" from which countries can pick and customise innovative solutions, thus promoting the replication of best practices and exploitable results.
- **Dissemination** – the results of the demo projects will be broadly disseminated by different means (e.g., workshops, webinars, publications, etc.), fostering the replication of the tested solutions. Additionally, the Mission will offer significant opportunities for knowledge and best practices sharing, also contributing to capacity building in countries not directly participating in the initiative.
- Provide **periodic updates** to the ExCo members

All Task Forces (TF) have nominated a lead member and an alternate member that will be responsible for providing periodic updates on their Task Force's progress and the status of national pilots to the GPFM ExCo members as well as by means of internal meetings and public workshops. In particular, the TF leads will report projects' highlights, main outcomes, next actions and foreseen activities and main synergies among different projects.



CONCLUSIONS AND FP1 WAY FORWARD

The GPFM Flagship Project 1 (FP1) "5 demos in five continents" is at the forefront of promoting power system breakthrough actions, emphasizing the urgency and the importance of demonstrating the viability and scalability of innovative solutions and technologies to be deployed across different continents.
The **FP1 National Pilots Report** is a vital response to the GPFM Action Plan 2022-2024. This Report is intended to support and inform policymarkers by showcasing selected ongoing or planned national pilot projects fully aligned with the innovation priorities identified by the mission, thus confirming the worldwide wealth of activity and effort to accelerate the energy system transformation and decarbonisation.

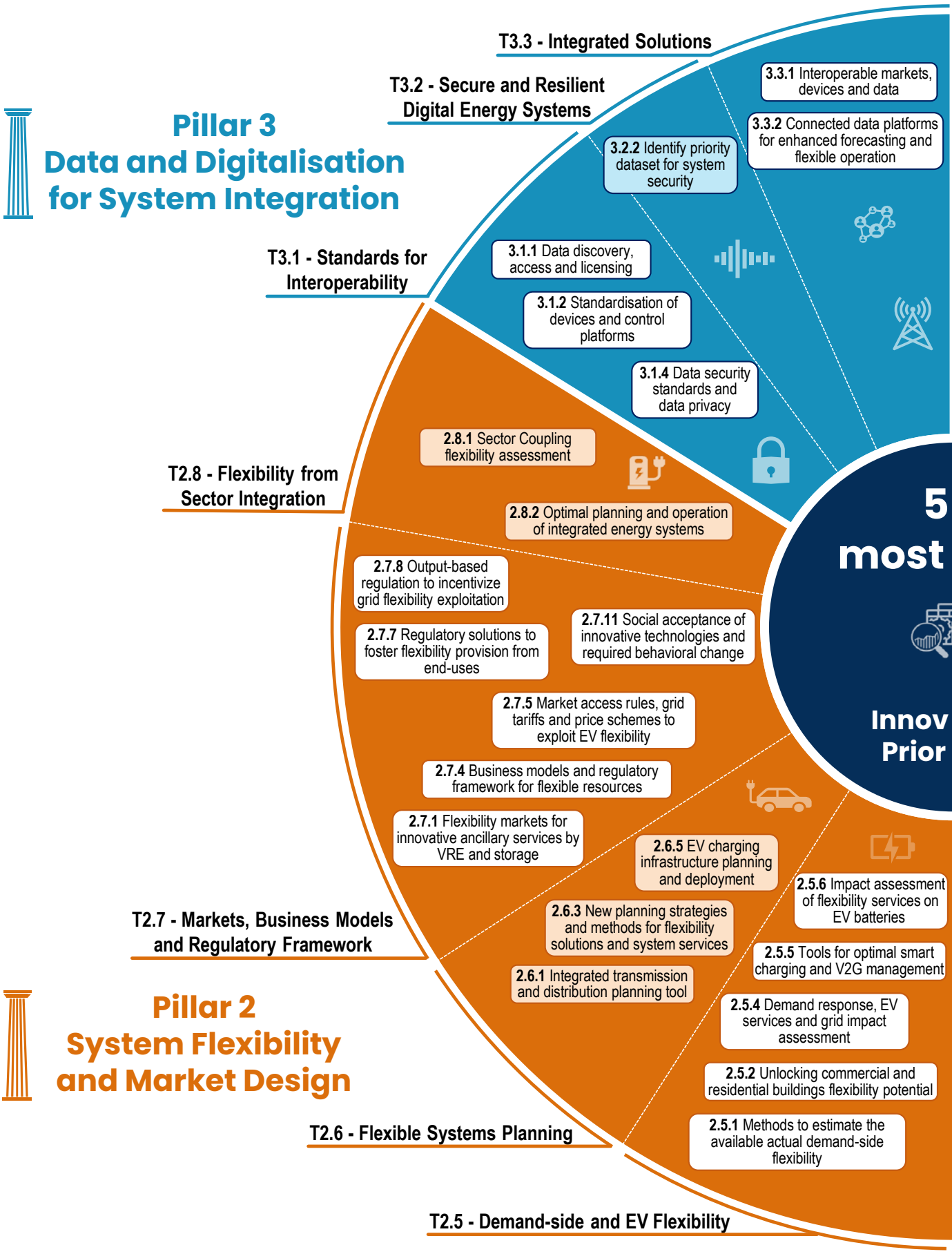
The GPFM ambitious 2022-2024 goal to launch 20+ national pilots with up to 80% VRE in 5 continents by Q4 2024 is within our reach or even exceeded, since this FP1 National Pilots Report already showcases **80 selected national pilot projects** that aim to implement and demonstrate innovative solutions to run power systems with up to 80% VRE, in 6 different continents. By delivering their innovation action, these national pilots will demonstrate different innovative technical, regulatory and market solutions and how they have been implemented and validated in different climates and geographies.

According to the Action Plan 2022-2024 and relying on the full support of the GPFM coalition members, the next steps of the FP1 activity will include the following key actions:

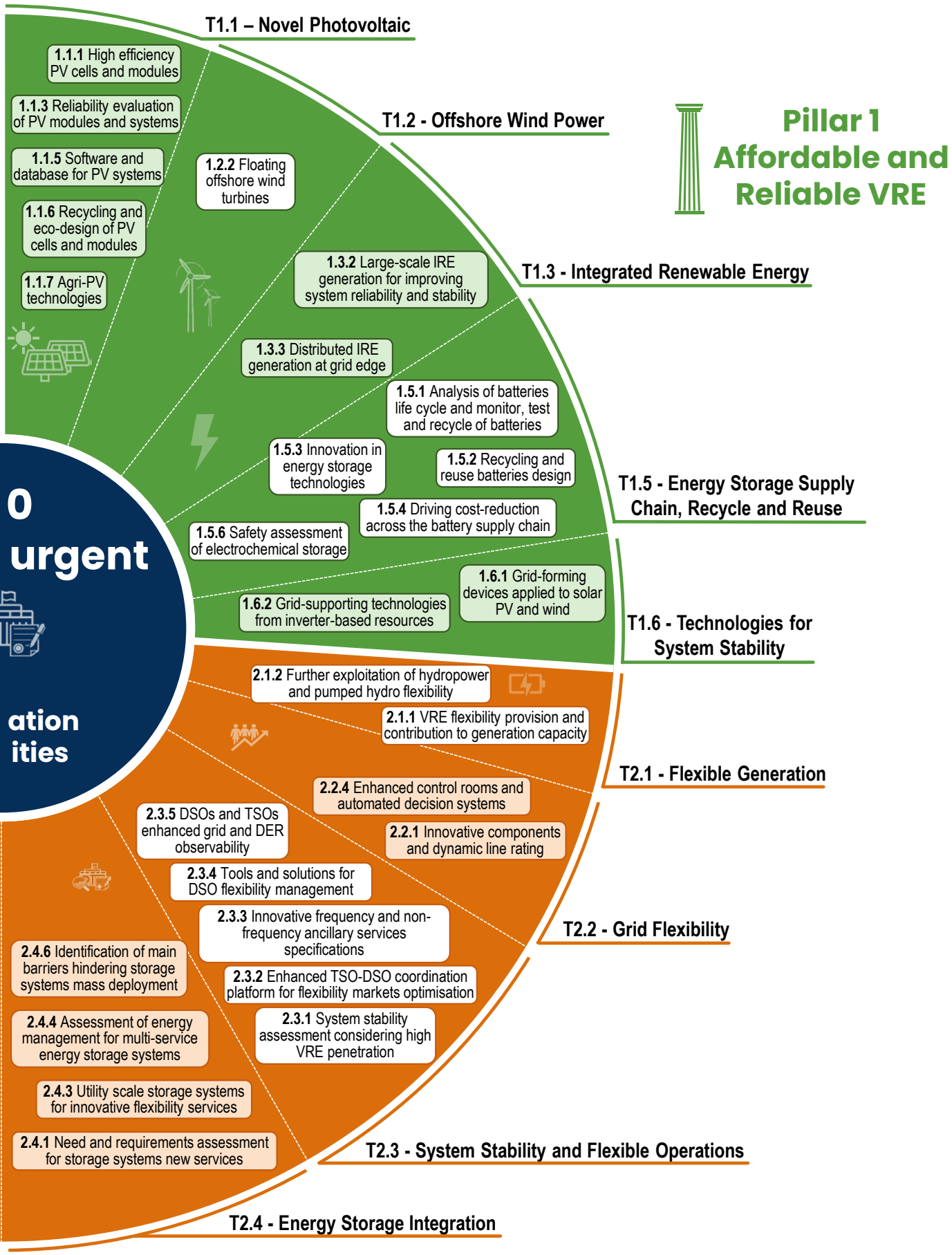
- **monitor** the national pilot projects progress;
- **engage** national pilot projects coordinators and main public and private partners;
- **analyse** the main results related to the different Innovation Priorities covered, innovative solutions and best practices in view of their broad replication;
- **share** the main learning and exploitable results as soon as national pilot projects start their dissemination phase.

Fostering effective collaboration and knowledge sharing among coalition members, stakeholders, and the energy community at large is crucial and will leverage existing synergies, to develop strong complementarity among national pilots, and ultimately support the implementation of Flagship Project 1 "5 demos in five continents".
In this regard, to achieve its long-terms objectives, **the GPFM will leverage the success of the national pilots' experiences, promote policy development and technological advancements** towards large-scale demonstrations projects successfully addressing the most urgent global innovation challenges to integrate up to 100% variable renewable energies by 2030. As a 10-year mission endeavour (2021-2030), the GPFM will continue to engage with its coalition members and stakeholders to implement its two ambitious Flagship Projects and progress the clean energy revolution this decade and beyond.

APPENDIX I: INNOVATION



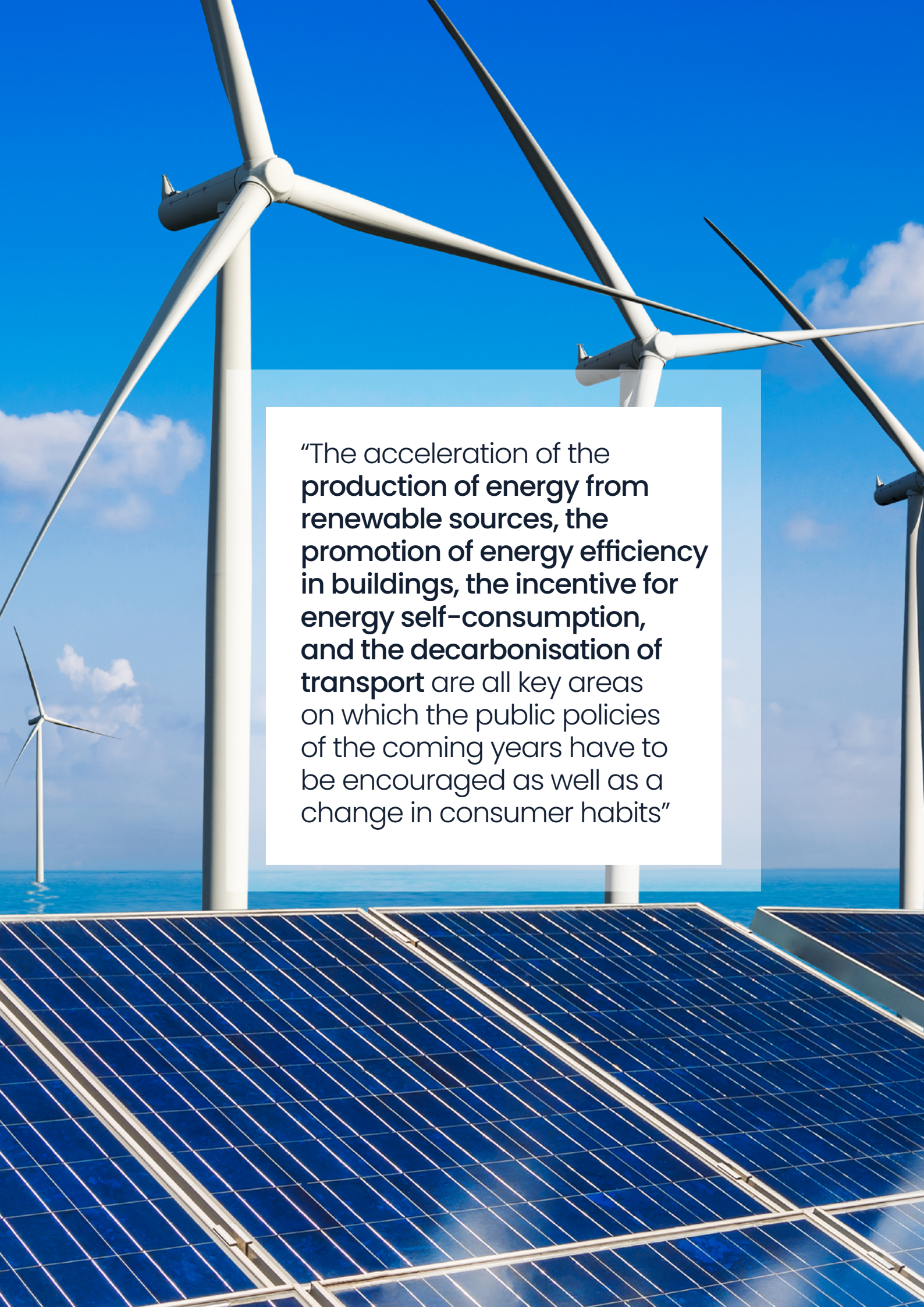
PRIORITIES LIST



Pillar 1
Affordable and Reliable VRE

APPENDIX II:
THE GPFM COALITION

The **Green Powered Future Mission** is a public-private partnership with members from MI countries, private sector companies and international organisations.



"The acceleration of the **production of energy from renewable sources, the promotion of energy efficiency in buildings, the incentive for energy self-consumption, and the decarbonisation of transport** are all key areas on which the public policies of the coming years have to be encouraged as well as a change in consumer habits"

MISSION INNOVATION

Green Powered Future Mission Coalition

China *- Ministry of Science and Technology (MOST)*
Italy *- Ministry of Environment and Energy Security (MASE)*
United Kingdom *- Department for Energy Security and Net Zero (DESNZ)*

Australia *– Department of Climate Change, Energy, the Environment and Water (DCCEEW)*
India *– Department of Science and Technology (DST)*
Saudi Arabia *– Ministry of Energy*
Spain *– Ministry of Science and Innovation (MCIN)*
IRENA – International Renewable Energy Agency
World Bank Group
Alperia SpA, Italy
Areti SpA, Italy
Enel Grids, Italy
National Grid Group, United Kingdom
Icebreaker One, United Kingdom
LONGi Green Energy Technology Co., Ltd., China
Xinjiang Goldwind Science Technology Co., Ltd., China

Austria *– Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)*
Brazil *– Energy Research Office (EPE)*
Canada *– Natural Resources Canada/Ressources Naturelles Canada (NRCan/RNCan)*
European Commission *– Directorate-General for Research & Innovation*
Germany *– Federal Ministry for Economic Affairs and Climate Action (BMWK)*
Japan *– Ministry of Economy, Trade and Industry (METI)*
Republic of Korea *– Ministry of Trade, Industry and Energy (MOTIE)*
IEA – International Energy Agency
Energy Networks Association (ENA), United Kingdom
Gestore dei servizi energetici (GSE), Italy
BSI Group, United Kingdom
TERNA S.p.A, Italy

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GREEN POWERED FUTURE MISSION