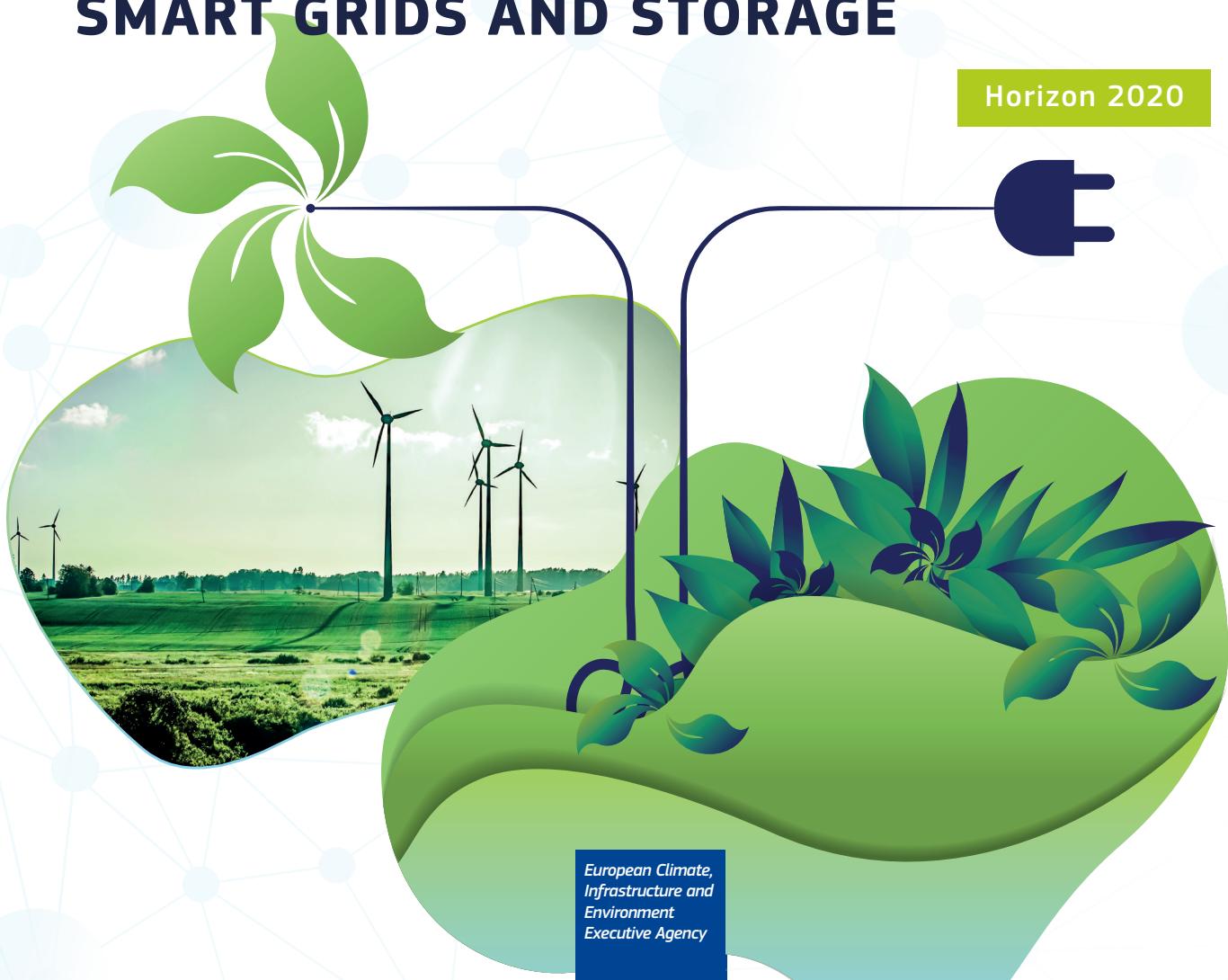




SUPPORTING INNOVATIVE SOLUTIONS FOR **SMART GRIDS AND STORAGE**

Horizon 2020



*European Climate,
Infrastructure and
Environment
Executive Agency*

CINEA

Climate, Environment, Infrastructure and Environment
Executive Agency

Funding a Green Future for Europe

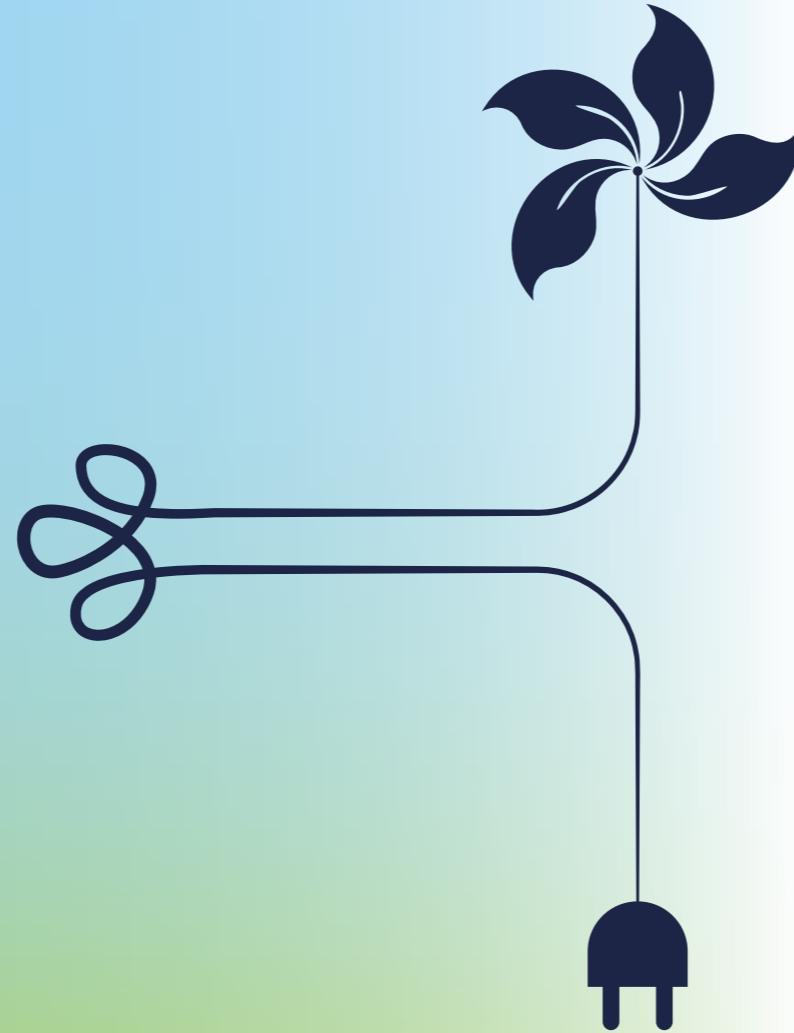


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ABOUT CINEA

Funding a Green Future for Europe

CINEA contributes to the European Green Deal by implementing parts of EU funding programmes for transport, energy, climate action, environment and maritime fisheries and aquaculture.

CINEA now manages the Connecting Europe Facility 2 (Transport and Energy), the Climate, Energy and Mobility Cluster of Horizon Europe, the LIFE programme, the Innovation Fund, the European Maritime, Fisheries and Aquaculture Fund, the

Renewable Energy Financing Mechanism and the Public Sector Loan Facility under the Just Transition Mechanism and seeks to promote synergies between the programmes in order to benefit EU citizens and promote economic growth.

CINEA implements two societal challenges of the Horizon 2020 programme: [Secure, clean and efficient energy](#), and [Smart, green and integrated transport](#). CINEA provides technical and financial

management services at all stages of the programme and project life cycle – from the calls for proposals, evaluation of projects and the award of financial support, to the follow-up of project implementation and control of the use of funds allocated.

CINEA provides visibility for EU funding opportunities and project results – and supports potential applicants and beneficiaries, allowing them to benefit from the Agency's long-standing experience of programme implementation with a high level of performance.

Climate, Infrastructure and Environment Executive Agency

COMPILE



INTEGRATING COMMUNITY POWER IN ENERGY ISLANDS

The COMPILE project shows how energy communities can optimise their operation under various regulatory schemes, leveraging different financing mechanisms and using diverse technologies. Cooperation within the community emerges as the key common aspect to fully control decentralised local energy systems, leading to a secure and sustainable energy supply, engaging all actors along the energy value chain.

The Slovenian pilot site Luče features a distribution grid not robust enough or not yet able to integrate a large amount of Renewable Energy Sources (RES), especially photovoltaic (PV), and a large investment is needed to future-proof the network. In addition, in many countries, PV investors wait for a long time for permission to connect to the grid or are even prohibited from installing new generation due

PROJECT TITLE
Integrating community power in energy islands
PROJECT DURATION
01/11/2018 - 30/04/2022 (48 months)
TOTAL COSTS
EUR 6,933,605
EU CONTRIBUTION
EUR 5,431,906
WEBSITE
https://www.ttt-project.eu/

to grid constraints.

COMPILE has demonstrated a way to expand renewable generation within the existing capacities without incurring costly upgrades and causing network issues. The COMPILE solutions allowed us to test new technologies for the

safe integration of RES into a congested local grid. In addition to deploying several technical solutions, enabling a thriving energy community and securing supply of the local energy system, the project also strengthened ties within the community and economic welfare of the residents.



© COMPILE

CoordiNet

LARGE SCALE CAMPAIGNS TO DEMONSTRATE HOW TSO-DSO SHALL ACT IN A COORDINATED MANNER TO PROCURE GRID SERVICES IN THE MOST RELIABLE AND EFFICIENT WAY

CoordiNet demonstrates how DSOs and TSOs can act in a coordinated manner to procure and activate grid services reliably and efficiently. The overarching goals of the project are formalised in three inter-related components:

1. demonstration of coordination between TSO/DSO at different sites, in cooperation with the market participants by defining:
 - coordination schemes and how they should evolve with increasing levels of distributed resources - for future flexibility needs of both DSOs and TSOs;
 - business Use Cases (BUCs) for all the demonstrators;
 - 39 Key Performance Indicators to assess and evaluate the demonstrations' economic, environmental and technical performance.

PROJECT TITLE
Large scale campaigns to demonstrate how TSO-DSO shall act in a coordinated manner to procure grid services in the most reliable and efficient way
PROJECT DURATION
01/01/2019 - 30/06/2022 (42 months)
TOTAL COSTS
EUR 19,191,479
EU CONTRIBUTION
EUR 15,077,588
WEBSITE
https://coordinet-project.eu/

2. definition and testing of a set of standardised products and the related key parameters for grid services, including the reservation and activation process and the settlement process;
3. specification and development of TSO-DSO-Consumers cooperation platforms. These platforms will pave the way for the interoperable development of a pan-European market and opening up of new revenue streams for consumers providing grid services.



edgeFLEX



PROVIDING FLEXIBILITY TO THE GRID BY ENABLING VPPS TO OFFER BOTH FAST AND SLOW DYNAMICS CONTROL SERVICES

edgeFLEX aims at further developing the concept of Virtual Power Plants (VPPs) to manage a wider range of generation and storage assets in a new way. By offering a set of fast and dynamic service-to-grid operations, the emergence of a new market for ancillary services will be enabled. The ten project partners propose a new architecture of VPPs with communications, supported by 5G, corresponding to multiple layers of dynamics, paving the way for a fully renewable energy system. With the expansion of the VPP concept to the idea of local energy communities, technical solutions are linked to societal expectations.

edgeFLEX develops this VPP's next generation concept and demonstrates it in the context of three field trials and accompanying

PROJECT TITLE
Providing flexibility to the grid by enabling VPPs to offer both fast and slow dynamics control services
PROJECT DURATION
01/04/2020 - 31/03/2023 (36 months)
TOTAL COSTS
EUR 4,999,747
EU CONTRIBUTION
EUR 4,999,747
WEBSITE
https://www.edgeflex-h2020.eu/

laboratory tests. The project explores innovative optimisations, financial tools and business scenarios and assesses the economic and societal impact. The user case for the edgePMU, the innovative implementation concept

developed in edgeFLEX project, was included in the 3GPP standard. It will be implemented and tested in the DSO power grid network and laboratory with the use of a live 5G network.



E-LAND

INTEGRATED MULTI-VECTOR MANAGEMENT SYSTEM FOR ENERGY ISLANDS

The continued decarbonisation of the energy sector using renewable energy sources provides both interesting opportunities for local energy systems and challenges for existing electricity networks. Mainland regions such as isolated villages, small cities, urban districts or rural areas often have issues with weak or non-existing grid connections. These areas are known as energy islands.

By building the E-LAND toolbox for multi-energy islands, the European-funded H2020 project addresses specific technological, societal, and business challenges. The project's overall goal is to aid in the decarbonisation of energy islands and remote villages.

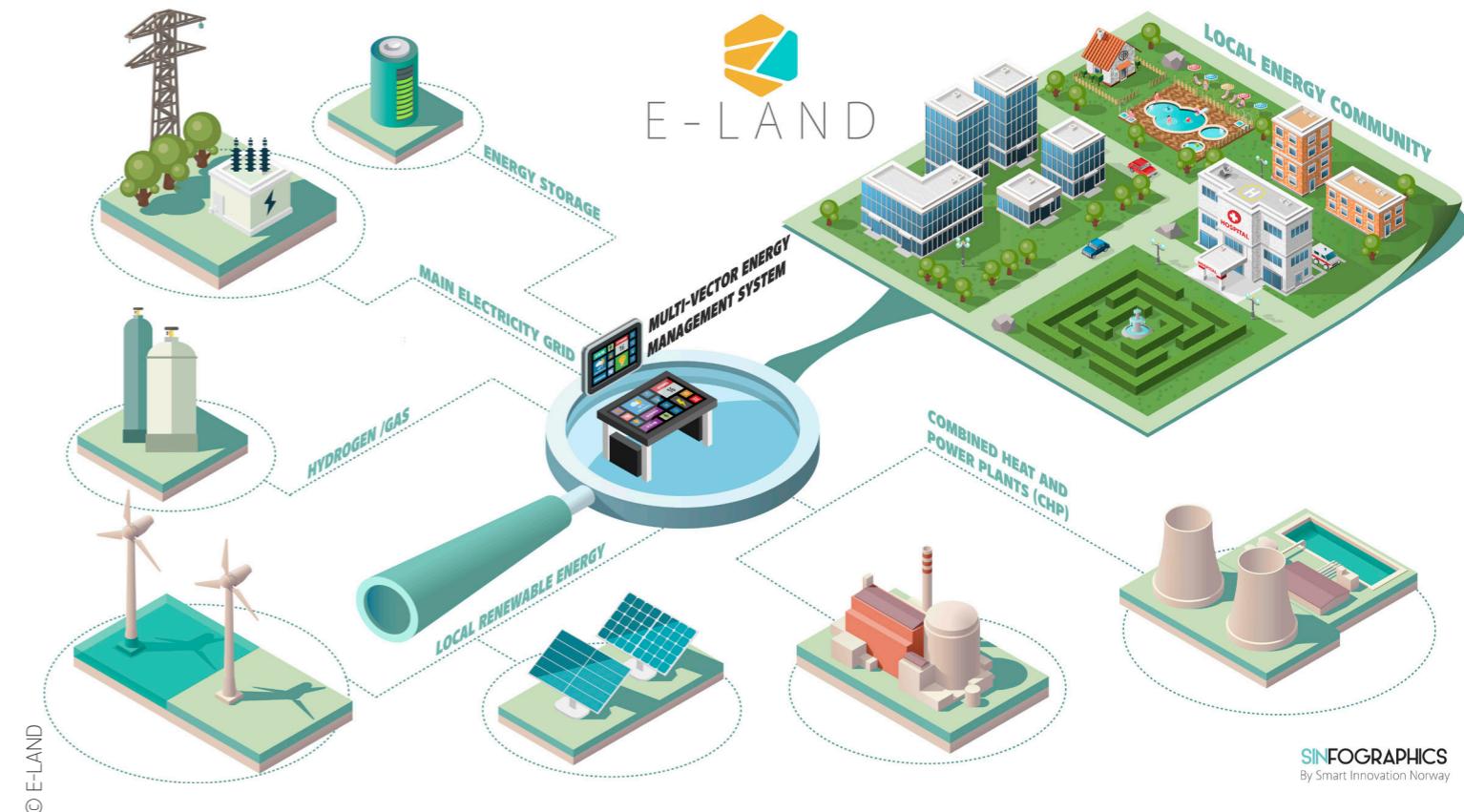
The E-LAND toolbox is a set of methodologies and ICT tools designed to optimise and control

PROJECT TITLE	Integrated multi-vector management system for Energy isLANDS
PROJECT DURATION	01/12/2018 - 30/11/2022 (48 months)
TOTAL COSTS	EUR 5,951,031
EU CONTRIBUTION	EUR 5,354,345
WEBSITE	https://elandh2020.eu/

multi-energy islands and isolated communities. The modular toolbox can be customised to meet local requirements and is expandable to incorporate new tools as new challenges arise. The toolbox is structured in three layers: the community, business, and technology tool layers. All the tools are ready to be

implemented and were tested in three European pilot sites and two Indian pilot sites.

The E-LAND project is also working towards creating a replication guideline for implementing the E-LAND solutions and the E-LAND toolbox beyond the project.



FEVER

FLEXIBLE ENERGY PRODUCTION, DEMAND AND STORAGE-BASED VIRTUAL POWER PLANTS FOR ELECTRICITY MARKETS AND RESILIENT DSO OPERATION

FEVER implements and demonstrates innovative solutions and services that leverage flexibility towards offering electricity grid services that address problems of the distribution grid, thus enabling it to function in a secure and resilient manner. The project encompasses technologies and techniques for the extraction of energy flexibility from energy storage assets and implements a comprehensive flexibility aggregation, management and trading solution. In addition, a decentralised ledger technology (DLT) based flexibility trading toolbox is being implemented enabling autonomous peer-to-peer trading. FEVER also implements goal-oriented applications and tools that empower DSOs with optimal grid observability and controllability. For all the innovation dimensions mentioned above, the first 18 months of the project were dedicated to their detailed

PROJECT TITLE

Flexible Energy Production, Demand and Storage-based Virtual Power Plants for Electricity Markets and Resilient DSO Operation

PROJECT DURATION

01/02/2020 - 31/07/2023 (42 months)

TOTAL COSTS

EUR 9,847,839

EU CONTRIBUTION

EUR 7,794,376

WEBSITE

<https://fever-h2020.eu/>

specification and to the implementation of the first prototypes of the corresponding methodologies, tools and applications. The next phase will be devoted to the finalisation

of the implementation, to their integration and testing, and to the technology deployment and piloting activities in multiple settings in Cyprus, Germany and Spain.



FITGEN



FUNCTIONALLY INTEGRATED E-AXLE READY FOR MASS MARKET THIRD GENERATION ELECTRIC VEHICLES

FITGEN aims at developing a functionally integrated e-axle ready for implementation in third generation electric vehicles. It is delivered at Technology Readiness Level (TRL) 7 and demonstrated on an electric vehicle platform designed for the European market (A-segment reference platform). The e-axle is composed of a latest generation Permanent-Magnet Synchronous Machine, driven by a SiC-inverter and coupled with a high-speed transmission. It is complemented by a DC/DC-converter for high voltage operation of the motor in traction and for enabling superfast charging.

The e-axle components (e-motor, inverter, DC/DC converter and transmission) are designed, prototyped, and assembled. They are currently undergoing a testing campaign to characterise the performance KPIs before proceeding with

PROJECT TITLE

Functionally Integrated E-axle Ready for Mass Market Third GENeration Electric Vehicles

PROJECT DURATION

01/01/2019 - 31/12/2021 (36 months)

TOTAL COSTS

EUR 5,841,242

EU CONTRIBUTION

EUR 4,998,667

WEBSITE

<https://fitgen-project.eu/>

e-axle integration on the demonstrator vehicle (FIAT 500-electric). Earliest results indicate that the motor is capable of 5.2 kW/kg at 23,000 rpm of maximum rotational speed (27,600 rpm

of sustained overspeed), while the inverter is capable of 26 kW/litre, exceeding the initial targets of the project.



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FLEXITRANSTORE



AN INTEGRATED PLATFORM FOR INCREASED FLEXIBILITY IN SMART TRANSMISSION GRIDS WITH STORAGE ENTITIES AND LARGE PENETRATION OF RENEWABLE ENERGY SOURCES

FLEXITRANSTORE aims to contribute towards a pan-European transmission network with high flexibility and high interconnection levels.

The project has achieved significant results with its demonstration of large-scale storage and key technologies for future transmission grids. The project started in 2017, consisting of 30 partners, including TSOs, DSOs, NRAs, Market Operators, Service Providers and Manufacturers with demonstration activities in Bulgaria, Cyprus, Greece and Slovenia.

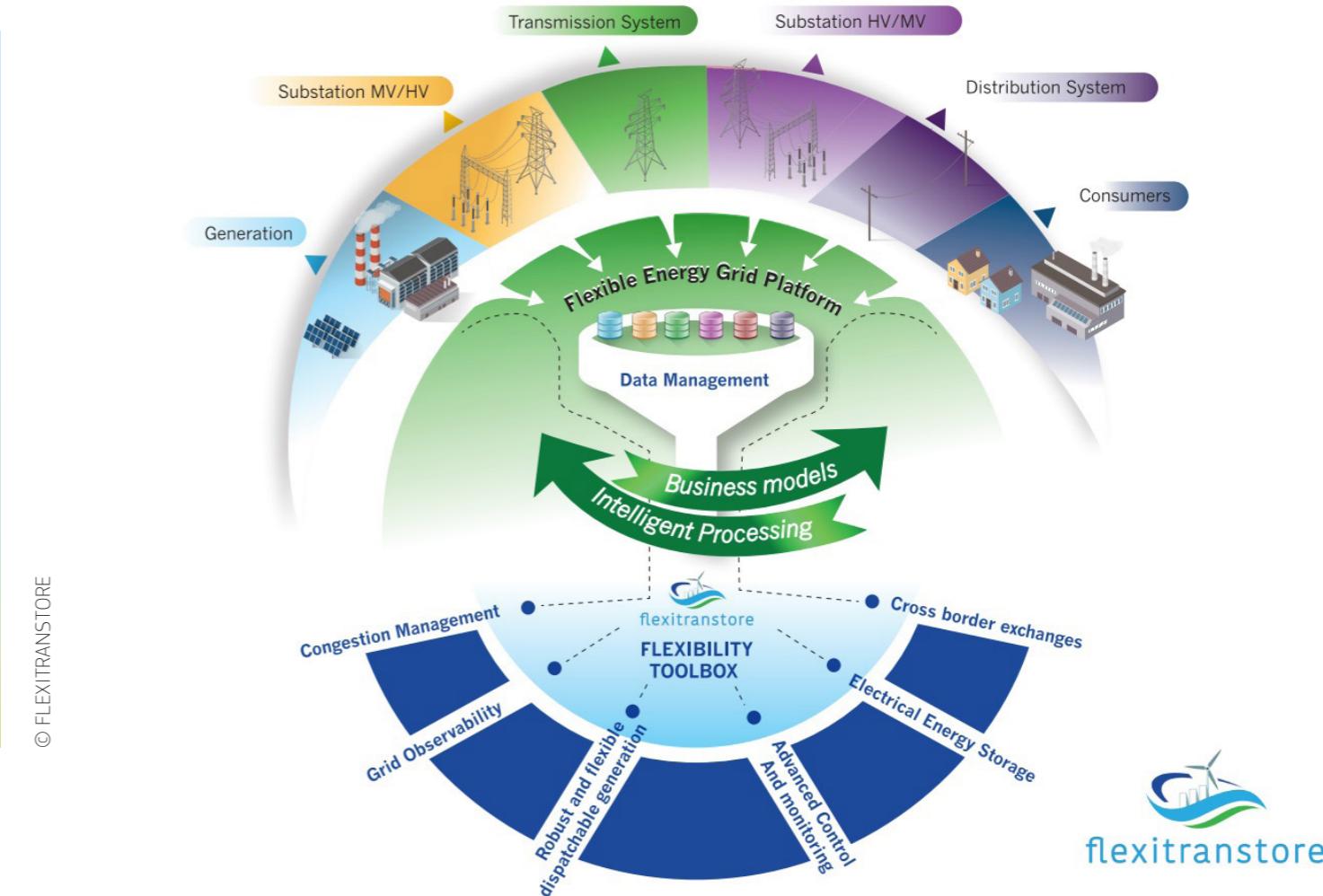
Within the core of the FLEXITRANSTORE project lies the Flexible Energy Grid (FEG) platform, which is a powerful integrated software offering novel solutions for TSOs (and DSOs), aiming to unleash the flexibility potential of the power systems. The FEG platform, through

PROJECT TITLE	An Integrated Platform for Increased FLEXibility in smart TRANSmision grids with STORage Entities and large penetration of Renewable Energy Sources
PROJECT DURATION	01/11/2017 - 30/04/2022 (54 month)
TOTAL COSTS	EUR 21,399,588
EU CONTRIBUTION	EUR 17,008,101
WEBSITE	http://www.flexitranstore.eu/

its toolbox utilised by the project's large-scale demonstrations, allows the provision of services focusing on three main pillars:

1. system operation services, handling the day ahead scheduling and the intra-day and balancing timeframe for flexibility;
2. strategic planning services for forecasting future needs and assessing investment plans;
3. flexibility services trading, in a wholesale market platform for the trading of flexibility in the intra-day timeframe.

The FEG platform covers the whole energy value chain, introducing innovative solutions at all levels of the power systems. The integration of these solutions and the respective piloting in 8 large-scale hardware-based demonstrations has led to significant results.



GIFT



GEOGRAPHICAL ISLANDS FLEXIBILITY

GIFT is an innovative project that aims to decarbonise the energy mix of European islands. European islands have to abide by the law of their countries that push towards a greener energy mix to comply with the European and international agreements. GIFT is developing innovative systems to allow islands to integrate vast amounts of renewables.

Multiple innovative solutions, such as a virtual power system, energy management systems for harbours, electrical ferries, factories, and homes, better prediction of supply and demand and visualisation of this data through a Geographic Information System (GIS) platform, and innovative storage systems allowing synergies between electrical, heating and transportation networks are being developed.

PROJECT TITLE	Geographical Islands FlexibiliTy
PROJECT DURATION	01/01/2019 - 30/06/2023 (54 months)
TOTAL COSTS	EUR 12,151,534
EU CONTRIBUTION	EUR 9,555,708
WEBSITE	https://www.gift-h2020.eu/

The partners developing and demonstrating the solutions in two lighthouse islands - Hinnøya, Norway's largest island, and the small island of Procida in Italy study the replicability of the solution on the Greek island of Evia and

the Italian island of Favignana. Currently, the project is being implemented through integration activities of solutions on the Procida and Hinnøya islands.



IElectrix



INDIAN AND EUROPEAN LOCAL ENERGY COMMUNITIES FOR RENEWABLE INTEGRATION AND THE ENERGY TRANSITION

The IElectrix project develops innovative technical solutions and tools to:

- accelerate the integration of Renewable Energy Sources into the distribution networks in regions where networks need to be reinforced, the so-called Energy Islands;
- prepare and facilitate the implementation of Local Energy Communities.

In this context, 15 European partners and 1 Indian partner have designed and implemented 5 real-scale demonstrators coordinated by Distribution System Operators implementing embedded electric island systems in Austria, Germany and Hungary as well as an urban microgrid in Delhi, India.

It is the first Horizon 2020 smart grid project funded by the European Union involving an

PROJECT TITLE	Indian and European Local Energy Communities For Renewable Integration and the Energy Transition
PROJECT DURATION	01/05/2019 – 31/10/2022 (42 months)
TOTAL COSTS	EUR 10,736,974
EU CONTRIBUTION	EUR 7,940,098
WEBSITE	https://ielectrix-h2020.eu/

actual demonstration in India.

The 5 demonstrators are based on different regulatory and ecosystem contexts. The 2 Hungarian demonstrators aim to reduce the peak loads and voltage changes due to renewable generation. The Indian demonstrator allows improving the resilience of a local energy

community already equipped with PV panels. The German demonstrator aims to postpone costly network reinforcements while integrating massive renewable generation. Finally, the Austrian demonstration integrates an existing energy community into the network.



INTERFACE

TSO-DSO-CONSUMER INTERFACE ARCHITECTURE TO PROVIDE INNOVATIVE GRID SERVICES FOR AN EFFICIENT POWER SYSTEM

To support the European energy transformation, the INTERRFACE project designs, develops and exploits the Interoperable pan-European Grid Services Architecture (IEGSA) to act as the interface between the power system (Transmission and Distribution System Operators) and the customers and allow the seamless and coordinated operation of all stakeholders to use and procure common services. In the frame of this development, state-of-the-art digital tools based on blockchains and advanced data management will provide new opportunities for electricity market participation and thus engage consumers into the INTERRFACE proposed market structures that will be designed to exploit Distributed Energy Resources.

The INTERRFACE project connects 42 partners

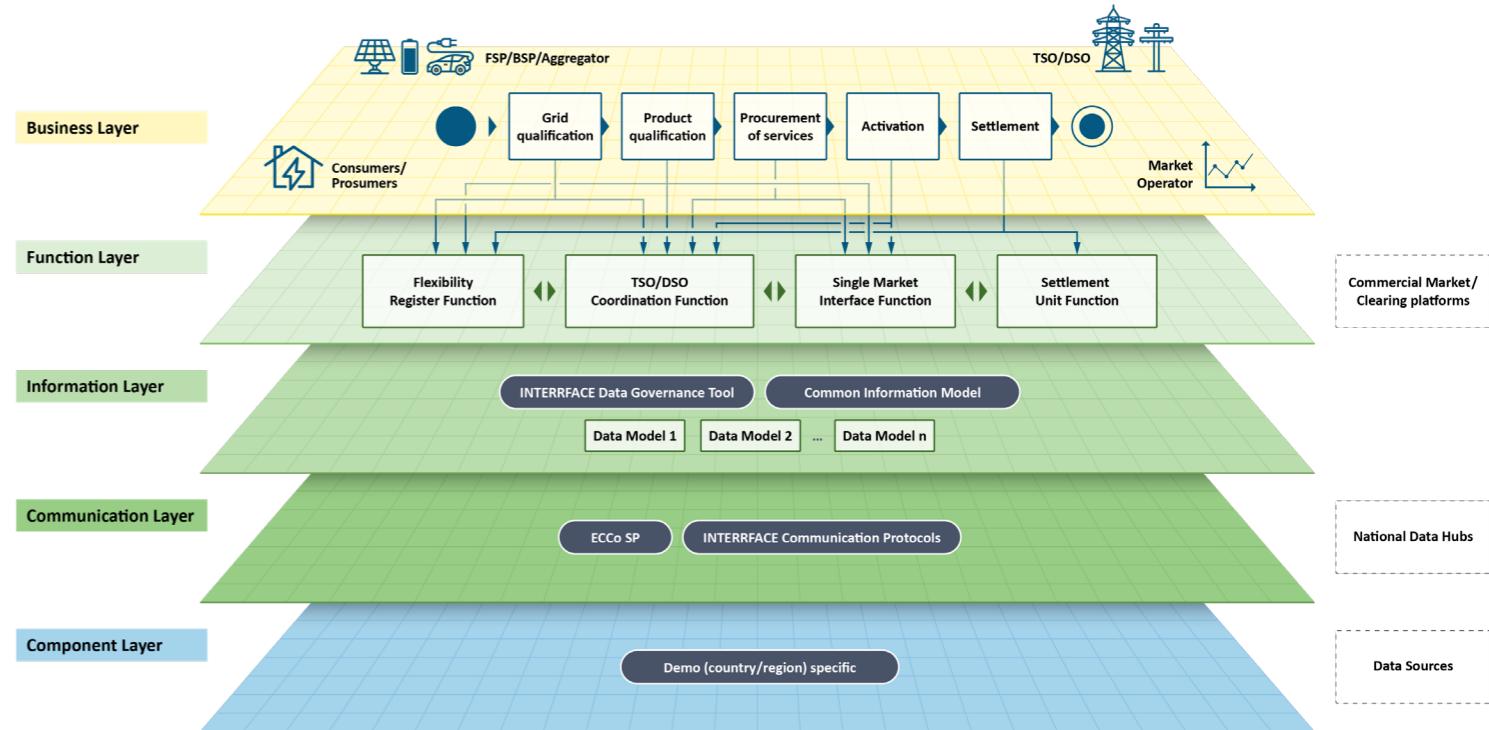


from 16 European countries, including TSOs, DSOs, service providers, aggregators, market operators, research institutes and universities. Through the 48 months of the project, the

IEGSA platform will be demonstrated in 7 different environments to conclude a scalable and replicable solution for a variety of actors in the energy value chain by 2022.

PROJECT TITLE	TSO-DSO-Consumer INTERFACE aRchitecture to provide innovative grid services for an efficient power system
PROJECT DURATION	01/01/2019 - 31/12/2022 (48 months)
TOTAL COSTS	EUR 20,990,320
EU CONTRIBUTION	EUR 16,808,962
WEBSITE	http://www.interrface.eu/

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Merlon

INTEGRATED MODULAR ENERGY SYSTEMS AND LOCAL FLEXIBILITY TRADING FOR NEURAL ENERGY ISLANDS

MERLON has developed an integrated local energy management system (ILESEM) to support local distribution grid operation in a high-renewable energy scenario. ILESEM performs a multi-level optimisation using decentralised intelligence for the efficient coordination of distributed energy resources within a local distribution grid.

The MERLON solution is currently demonstrated in two local energy system pilot sites, which can be characterised as “energy islands” in a non-geographical way. Both in the region of Strem (Austria) and Alicante (Spain) a massive increase in renewable energy sources (RES) led to technical issues in the electricity distribution grid, including the curtailment of RES production, voltage violations, and other power quality issues.

PROJECT TITLE	Integrated Modular Energy Systems and Local Flexibility Trading for Neural Energy Islands
TOTAL DURATION	01/01/2019 - 31/12/2021 (36 months)
TOTAL COSTS	EUR 7,382,308
EU CONTRIBUTION	EUR 5,739,471
WEBSITE	https://www.merlon-project.eu/

The expected impact of the two MERLON pilots sites includes: up to 27% in energy cost savings; more than 50% in peak load reduction; user acceptance greater than 95% and ~ 80 kTons CO₂ emissions reduction. The initial

project results are:

- energy savings by HVAC operation modification up to 20%;
- user perceived thermal comfort up to 97%;
- electricity costs in an “energy island” can be reduced by up to 3.5%.



PlatOne



PLATFORM FOR OPERATION OF DISTRIBUTION NETWORKS

“Innovation for the customers, innovation for the grid” is the vision of the H2020 funded project Platone - Platform for Operation of distribution Networks. The consortium of energy and IT experts develops novel solutions to make energy flexibility a tradable good. Unlocking these flexibilities allows the integration of more renewable energies while maintaining electricity grid stability. Increased penetration of volatile renewable energy sources and less predictable consumption patterns require more real-time services and a high level of awareness for the operators.

Platone is unique in its approach: While creating open and fair conditions for all the stakeholders in managing flexibility, it promotes a tight interaction between markets and operation. This transformation also implies a completely new

PROJECT TITLE
PLATform for Operation of distribution NEtworks
PROJECT DURATION
01/09/2019 - 31/08/2023 (48 months)
TOTAL COSTS
EUR 9,600,957
EU CONTRIBUTION
EUR 7,985,912
WEBSITE
https://www.platone-h2020.eu/

role for the customers: from being peripheral users they become key players of the energy system.

The Platone Open Framework is currently tested and fully validated thanks to large pilots in

Germany, Greece and Italy and a cooperation project in Canada. A core element of the Open Framework was launched as a project in the well-known Linux Foundation Energy.



POLYPHEM



SMALL-SCALE SOLAR THERMAL COMBINED CYCLE

POLYPHEM aims at improving the flexibility and performance of small-scale Concentrated Solar Power plants, thanks to a solar-driven micro gas-turbine technology. As a final result, the project will build a 60 kW prototype plant with a 1.3 MWh thermal storage unit and will validate this innovative power cycle in a relevant environment Technology Readiness Level (TRL) 5, at the Themis solar tower in Targassone.

In the short-term, the project will reinforce the competitiveness of this new low carbon energy technology and in the medium-to-long-term, favour its integration into the European energy mix and contribute to the mitigation of climate change.

PROJECT TITLE

Small-Scale Solar Thermal Combined Cycle

PROJECT DURATION

01/04/2018 - 31/03/2022 (48 months)

TOTAL COSTS

EUR 4,975,961

EU CONTRIBUTION

EUR 4,975,961

WEBSITE

<https://www.polyphem-project.eu/>

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TRINITY

TRANSMISSION SYSTEM ENHANCEMENT OF REGIONAL BORDERS BY MEANS OF INTELLIGENT MARKET TECHNOLOGY

TRINITY enhances the cooperation and coordination among the Transmission System Operators (TSO) of South-Eastern Europe (SEE) and supports the harmonization of the electricity markets in the region, whilst promoting a higher penetration of renewable energies.

TRINITY promotes electricity resources within and among SEE countries by fostering the local production of renewable energies while increasing the interconnection between these countries for reducing the energy imports from non-EU countries and then lowers energy prices for households whilst reducing CO₂ emissions.

TRINITY develops complementary software platforms. They will be validated through real-life demonstrations in 8 SEE countries (Bosnia

PROJECT TITLE	TRAnsmission system enhancement of regloNal borders by means of IntelligenT market technologY
PROJECT DURATION	01/10/2019 - 30/09/2023 (48 months)
TOTAL COSTS	EUR 13,151,140
EU CONTRIBUTION	EUR 9,854,253
WEBSITE	http://trinityh2020.eu/

and Herzegovina, Bulgaria, Croatia, Greece, Hungary, Montenegro, North Macedonia, and Serbia).

The demonstration tests will be conducted under three pilot scenarios linked to the three axes of the project: TSOs (and

their management by Regional Security Coordinators), Electricity markets and Renewables. This evaluation will include the technical validation of the products, socio-economic and environmental impact and business models.



X-FLEX



INTEGRATED ENERGY SOLUTIONS AND NEW MARKET MECHANISMS FOR AN EXTENDED FLEXIBILITY OF THE EUROPEAN GRID

The X-FLEX main objective is the integration and combination of energy systems in an optimal way, both on the generation side Distributed Energy Resources (DER) and on the demand side vehicle-to-grid (V2G) power to heat which allows all actors, including final prosumers, to offer their flexibility in the local and wholesale market, thus generating benefits for all. This supports the penetration of distributed renewable energy in the network, ensuring cleaner and cheaper energy, as well as improving the flexibility and stability of the supply and increasing the resilience of the electricity grid, avoiding massive investments in infrastructure, especially during extreme weather events.

To make use of this flexibility in an optimal and fair way, X-FLEX has designed and developed

PROJECT TITLE
Integrated energy solutions and new market mechanisms for an eXtended FLEXibility of the European grid

PROJECT DURATION
01/10/2019 - 30/09/2023 (48 months)

TOTAL COSTS
EUR 9,463,657

EU CONTRIBUTION
EUR 7,314,485

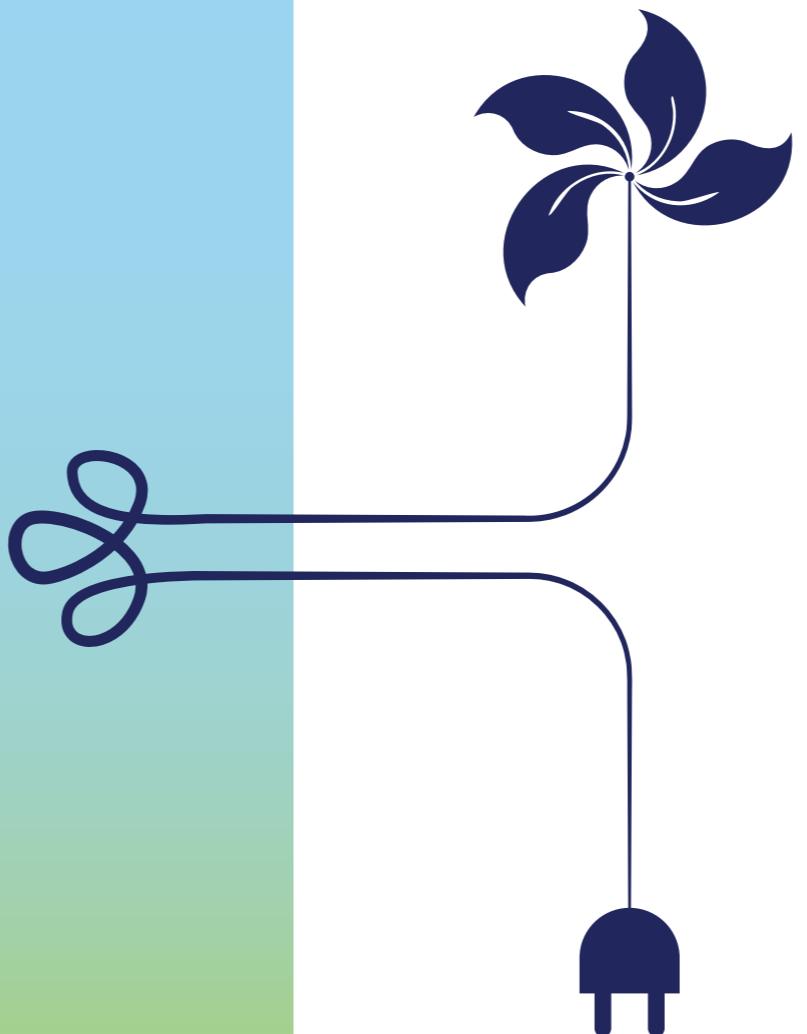
WEBSITE
<http://xflexproject.eu/>

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three complementary technology solutions (GRIDFLEX, MARKETFLEX and SERVIFLEX) that offer services to all players, from network operators (TSO, DSO, microgrid operators) to final consumers and other intermediate players,

such as retailers and aggregators. These solutions will be tested in real conditions at 4 pilot sites in 3 EU member states: Bulgaria, Greece and Slovenia.





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All projects featured in this publication are managed by CINEA, the European Climate, Infrastructure and Environment Executive Agency, established by the European Commission under the motto 'Funding a Green Future for Europe'.



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