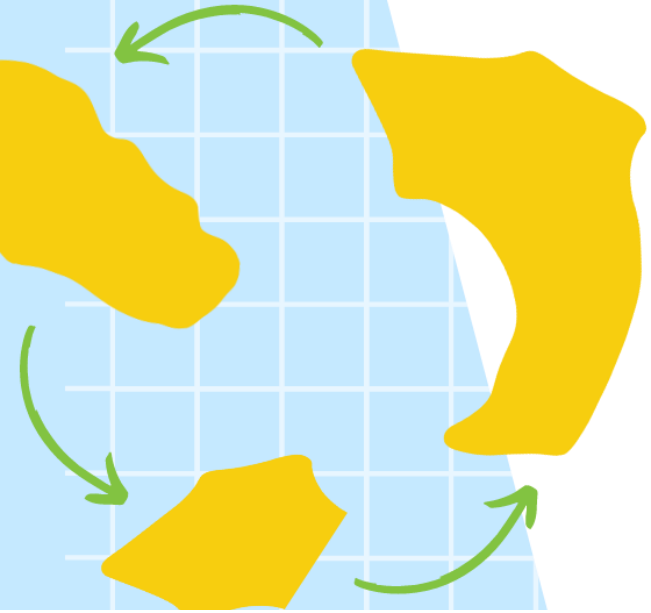
ISLET

Enabling Renewable Energy Communities on Mediterranean Small Islands



Sustainable Places 2024

Tuesday 24 September 2024

The ISLET project has received funding from the LIFE Programme of the European Union under Grant Agreement No. 101120073.

ISLET
In pills

ISLET focuses on developing Renewable Energy Communities (RECs) on small Mediterranean islands, by empowering local authorities to create a favourable environment for RECs and collaborate with citizens.

2024

Coordinator: Istituto sull'Inquinamento Atmosferico, Consiglio Nazionale delle Ricerche

GRAD CRES

ASTYPALEA #AEGEANENERGYSPRING

Comune di Procida

LEGAMBIENTE

island movement

ENERGI AKADEMIET

DAFNI Network of Sustainable Greek Islands

MIEMA Malta Intelligent Energy Management Agency

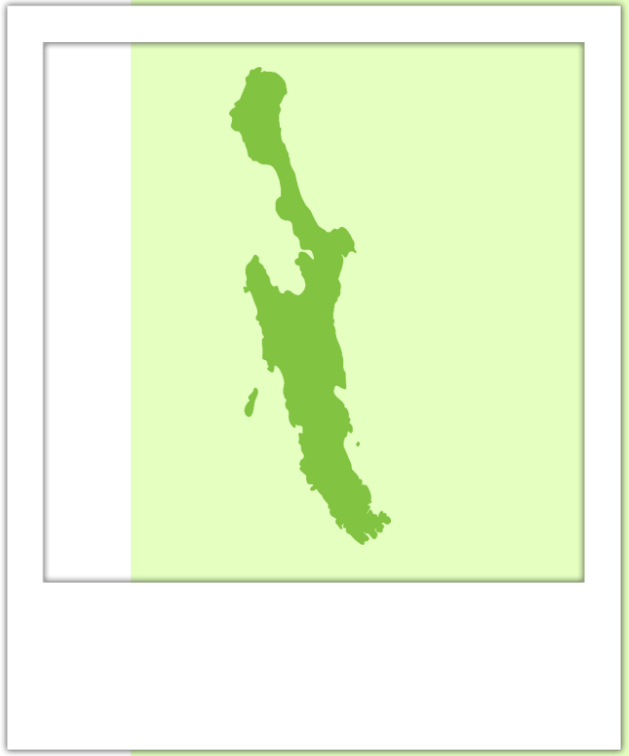
ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

FEDARENE

- **7 Renewable Energy Communities (RECs)** (3 in pilot islands and 4 in test islands).
- **30 replication islands.**
- **30 local authorities representatives and staff trained** on the regulatory framework, funding possibilities, and formal steps to take to build a REC.
- **Improvement of knowledge on RECs for 70 small islands** local authorities.
- **At least 500 citizens (180 families)** involved in 3 pilot islands and 4 test islands.
- **5 help desks** at EU level to support local authorities in the development of RECs also after the project end

Pilot island: **Cres, Croatia**

- Largest Adriatic archipelago (Cres 2,879 residents, Lošinj seasonal).
- Connected to mainland electricity via subsea cables.
- Holds untapped potential for solar and offshore wind energy



Establish new energy communities for co-ownership of renewable projects.

Leverage existing energy cooperative as a foundation for community development.

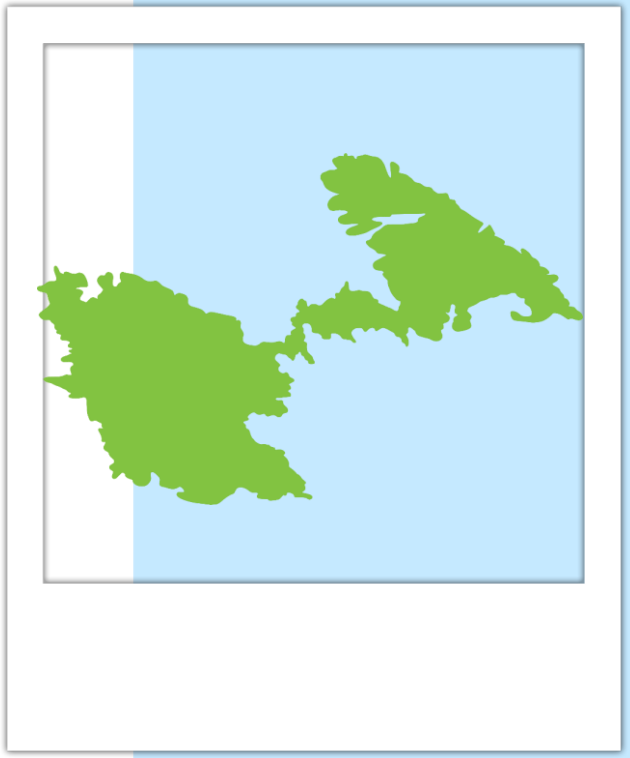
ISLET Focus

Advocate for a legal framework that supports renewable energy communities in Croatia.

Experiment with REC models, including a 0.5 MW solar plant with citizens participation in ownership and operation.

Pilot islands: **ASTYPALEA, Greece**

- Aegean gem (1,334 residents) known for tourism.
- Relies on a local 4 MW thermal power plant (limited solar PV in 2021).
- Partnering in the "Smart and Sustainable Island" project to introduce electric vehicles.



Create an energy community for co-ownership of a hybrid renewable energy station.

Partner with local government and businesses for a holistic clean energy approach.

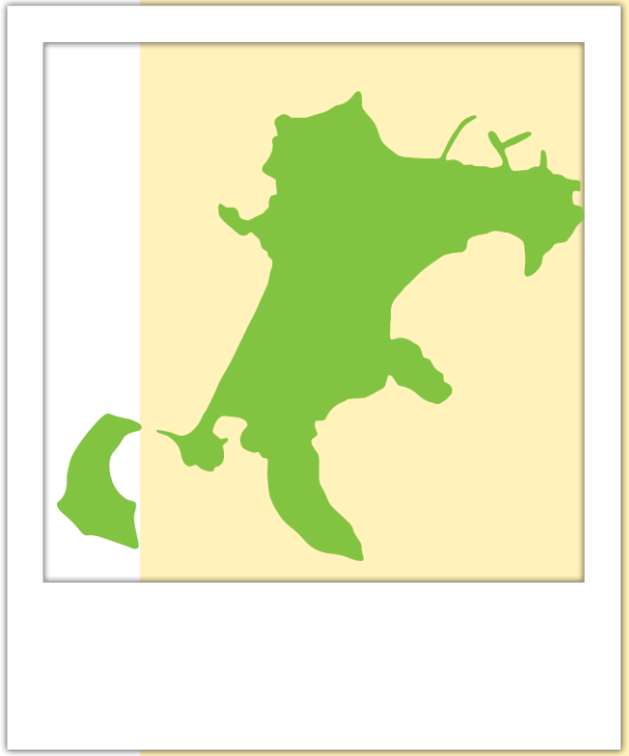
ISLET Focus

Explore innovative business models for managing energy and transportation infrastructure.

Aspire to become an "Integrated Smart and Green Utility Island Operator."

Pilot island: **Procida, Italy**

- Peaceful & green with stunning landscapes (10,183 residents).
- Rising renewable energy use, with 339 kW solar PV and potential for more.
- Grid connected to Ischia via submarine cable.



Drive social benefits through a REC.

Promote citizen participation in the development and ownership of RES infrastructure.

ISLET Focus

Foster social connections and collaboration around energy and sustainability.

Develop a model transferable to other islands facing similar challenges.

ISLET

Barriers and solutions in islands' energy transitions

1 Technical Barriers

- Islands are often isolated from mainland grids, **requiring self-sufficiency**.
- Renewable Energy Sources (RES) like wind and solar **need storage solutions** to ensure stable supply.
- **Existing diesel generators** are inefficient and environmentally harmful.

2 Economic Barriers

- **High transport and fuel costs** due to geographical isolation.
- Renewable energy investments are less appealing due to **small market size.**

3 Political/Social Barriers

- Complex political decision-making and **lack of communication between national and local levels**.
- **"Not in My Backyard" (NIMBY)** opposition from local residents due to perceived environmental or visual impact.

4 Environmental Barriers

- **Regulations on emissions** (NOx and SOx) create pressure to transition from fossil fuels.
- Renewable projects like wind turbines **may affect natural landscapes**.

Technical Solutions

Focus on **energy storage** and **smart grid technologies** to balance supply and demand.

Integrating local renewable energy resources like solar, wind, and biomass.

Social and Political Solutions

Promote **citizen ownership** in energy projects, creating buy-in and reducing resistance.

Enhance **policy support** and collaboration between local authorities and citizens.

Economic Solutions

Facilitate access to **EU and national funding** for small island projects.

Provide **financial tools** such as guarantees and seed funding for REC development.

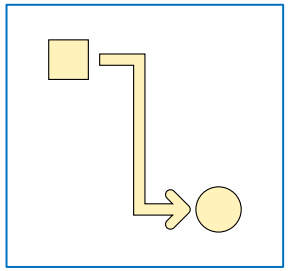
Environmental Solutions

Complying with Emission Regulations, Transitioning from traditional diesel generators to renewable energy sources

Careful planning of renewable energy projects balancing energy needs with environmental preservation.

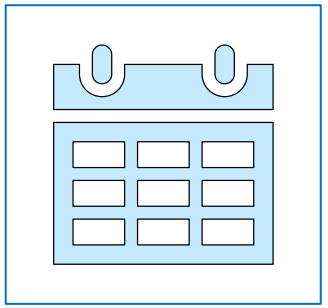
2024

Impact, activities and tools



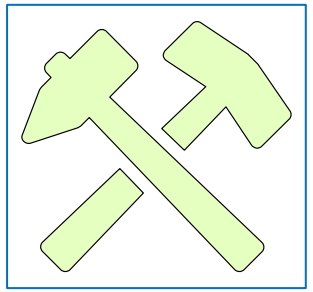
Expected Impact of ISLET

- **Environmental Impact**: Significant reduction in CO2 emissions on pilot islands.
- **Social Impact**: Increased citizen participation, promoting local cohesion and ownership of energy projects.
- **Economic Impact**: Boosting local economies by reducing reliance on imported fuel and increasing investment in local infrastructure.
- **Long-term Vision**: Build a **sustainable model** for energy independence across Mediterranean islands, setting an example for the EU and beyond.



Key Activities and Milestones

- **Capacity Building:** Training programs for local authority staff and citizens to enhance technical and management skills related to RECs.
- **Business Models**: Developing tailored financial strategies for RECs to improve access to funds.
- **Pilot Implementation**: Setting up 7 RECs in pilot and test islands to test and refine the model.
- **Peer-to-Peer Learning**: Creating a European network for knowledge exchange between island municipalities.
- **Citizen Engagement**: Actively involving local communities, targeting 500 citizens across 7 islands to join RECs.

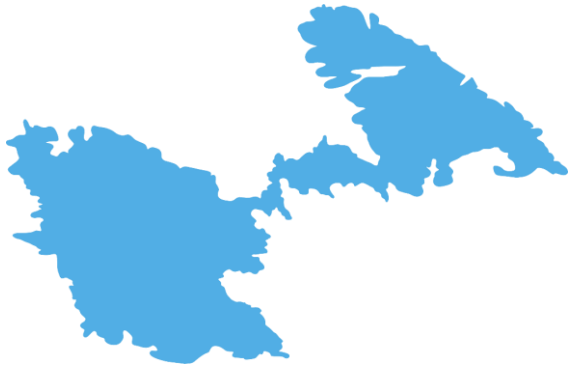


Tools and Resources Developed by ISLET

- **Standardized Guidelines** for REC formation on small islands, adaptable to different contexts.
- **Policy Recommendations** to streamline REC creation and operation, focusing on local authority support and citizen involvement.
- **Help Desks**: Five EU-level help desks to support local authorities in REC development during and after the project.

Lessons learnt

- ✓ No one-size-fits-all solution
- ✓ Different legal frameworks lead to different problems and solutions
- ✓ As Renewable energy Communities bring together technical, regulative and social issues, in small islands we have to consider technical, regulative and social barriers



- ✓ Islanders look at other small islands' experiences
- ✓ Small islands could be a perfect laboratory for RECs as for any experience of social innovation
- ✓ The water-energy nexus addressed ath the same time is a plus of island's projects
- ✓ For RECs in small islands in the Mediterranean basin, the involvement of municipalities plays a interesting role, as it could provide schools roofs (close in summer)

Test islands

- We will draft a model for Energy Community building specifically tailored on small islands, with documents, procedures, tips and lesson learnt
- Then we will test it in four other islands (Giglio, Diapontia, Korčula and Gozo)
- Peer-to-peer learning events will be organised between islanders on RECs experience.
- If you are an Island representative interested in building a REC, please **contact us!**

The ISLET project has received funding from the LIFE Programme of the European Union under Grant Agreement No. 101120073.

2024

ISLET

Thank you!

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fedarene.org/project/islet

REACT

Renewable Energy
for Self-Sustainable
Island Communities

REACT: a succes story for small islands

Fausto Sainz
COMET

Luxembourg - 24/9/24

This project has received funding from the H2020 programme under Grant Agreement No. 824395

Motivation of the REACT project

Energy cost overrun

- High dependency on the mainland energy market
- Losses during the transport and distribution of electrical energy (inefficient and costly energy transmission)

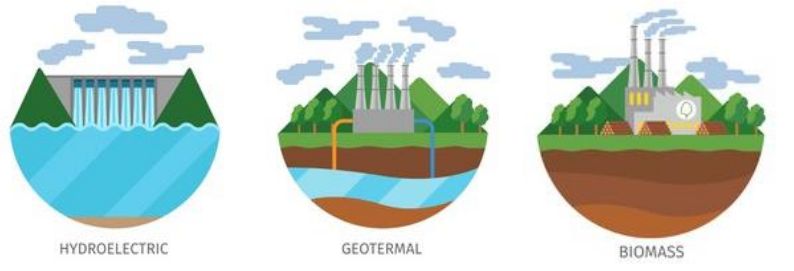
Fossil fuel consumption

- Lack of a strong generation/supply infrastructure
- High dependency on the energy import
- High GHG emissions

Variable load profiles

- Significant population fluctuations (tourist and non-tourist season)
- Different market contexts and climate conditions

There is a need to characterize and leverage islands' renewable energy resources (RES) to develop a more sustainable energy model



Aims and objectives of the REACT project

- REACT (*Renewable Energy for self-sustAinable island CommuniTies*) was a 4-year research project (01/01/2019 – 31/12/2022) funded by EU's Horizon 2020 programme that aims for island energy independency
- REACT demonstrated the potential of large-scale deployment of RES and storage assets on geographical islands to bring economic benefits, contribute decarbonizing local energy systems and reduce GHG emissions
- REACT delivered a scalable and adaptable cloud-based ICT platform for planning and management of RES/storage enabled infrastructure, supporting a holistic cooperative energy management strategy at the community level

Tools and techniques

- A holistic approach for targeted energy dispatch control actions (automated & manual).
- Real-time generation and load forecasting for optimal grid balancing.
- Innovative heat pumps and PV systems to be managed at community level.
- Energy storage: Deployment of high-capacity and environmentally friendly lithium-ion and aluminum-carbon batteries and conventional vented and valve-regulated lead-acid batteries and power-to-gas solutions.

Objectives social research

Find out about participants knowledge and interest on:

- Demand response
- Energy communities
- Renewable energies
- Users' satisfaction with technology provided

Tools

- Interviews
- TAM
- SUS

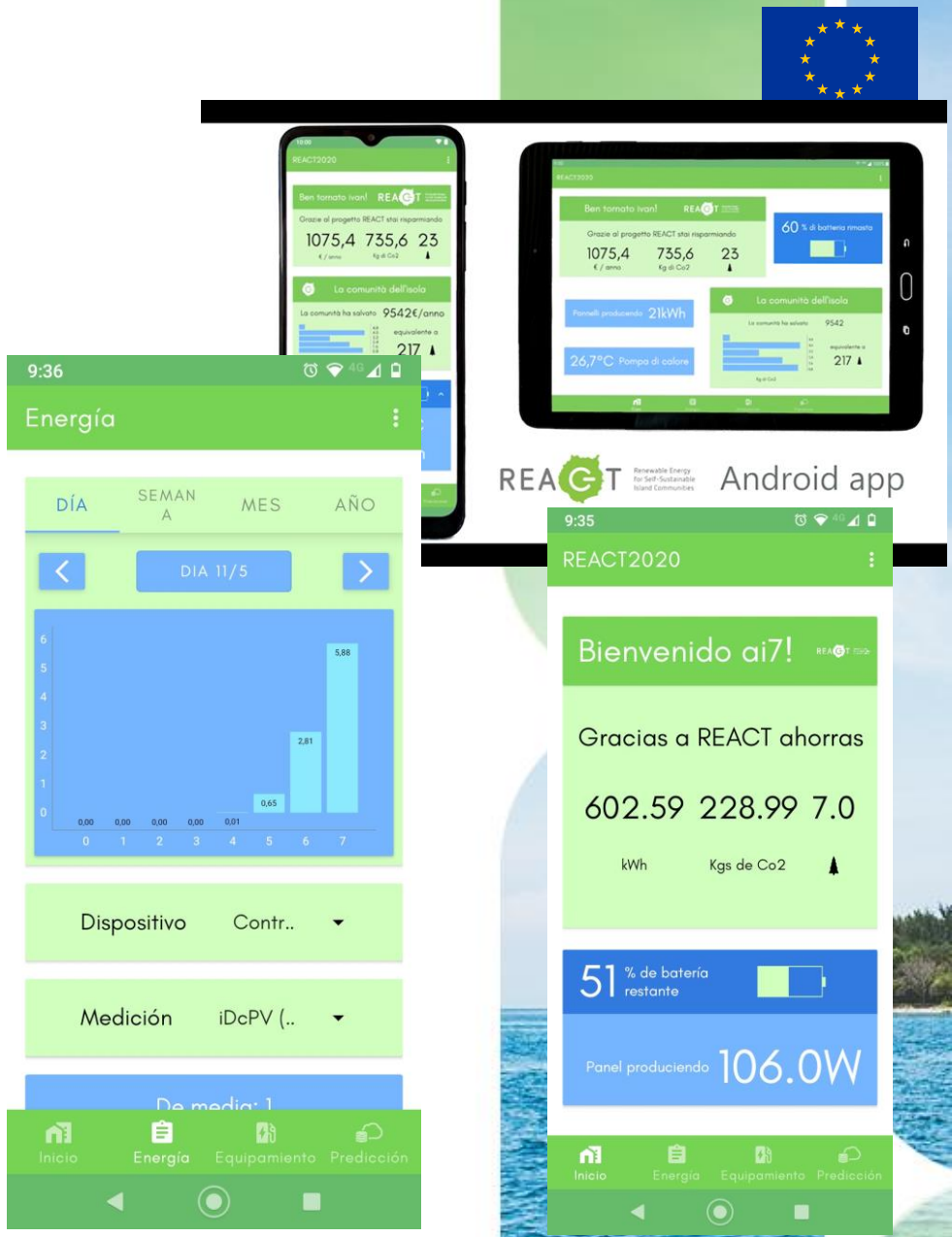
	Inis Mor	La Graciosa	San Pietro
Number Participants: Dwellings/other buildings	20 17/3	20 18/2	30/0 30/0
Interviews	18	14	15
Number TAM respondents	8	14	11
Number SUS respondents	8	14	6

Results interviews

- Most participants didn't know about demand response (exception made of San Pietro) at the time of the interviews, they also stated they wanted to learn more.
- They all perceived themselves as knowing about energy savings but not much about energy management and storage.
- All were concern about energy prices, specially in Inis Mor where they have a strong sense of community
- In San Pietro environmental protection and savings -both economic and energetic- were mentioned as some of the positive aspects of the technology
- La Graciosa, first reluctant (trusted figure needed) to participate and then very satisfied with the energy independence results.

Devices

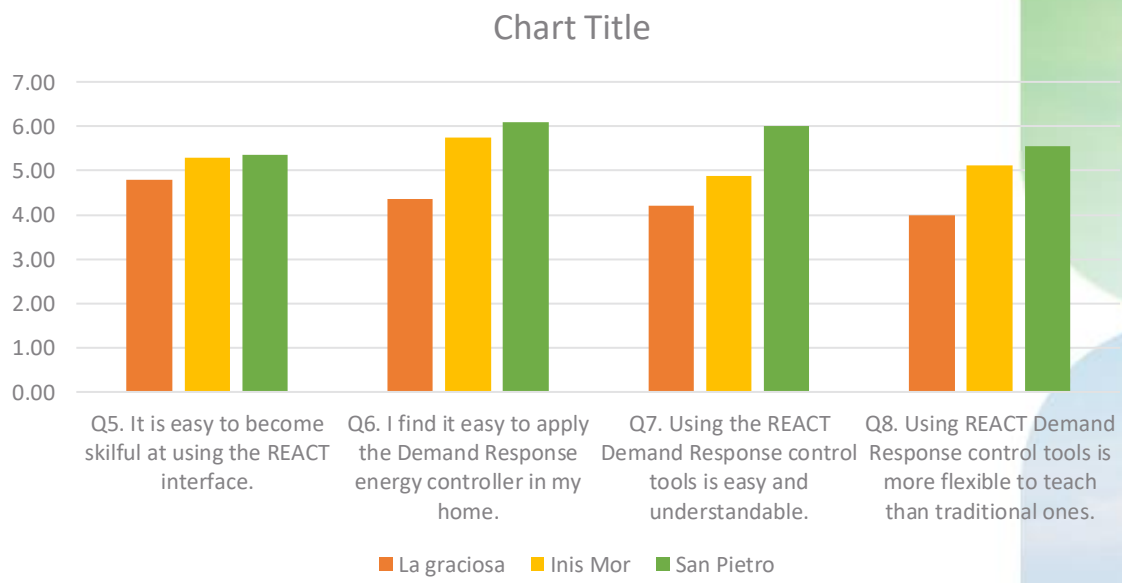
- Positive attitude towards the REACT solution in all four areas explored by the survey in all three islands:
  - Perceived usefulness
  - Perceived Ease of Use
  - Attitudes Toward Technology Use
  - Intention to use
- Minor differences were encountered among the three pilots



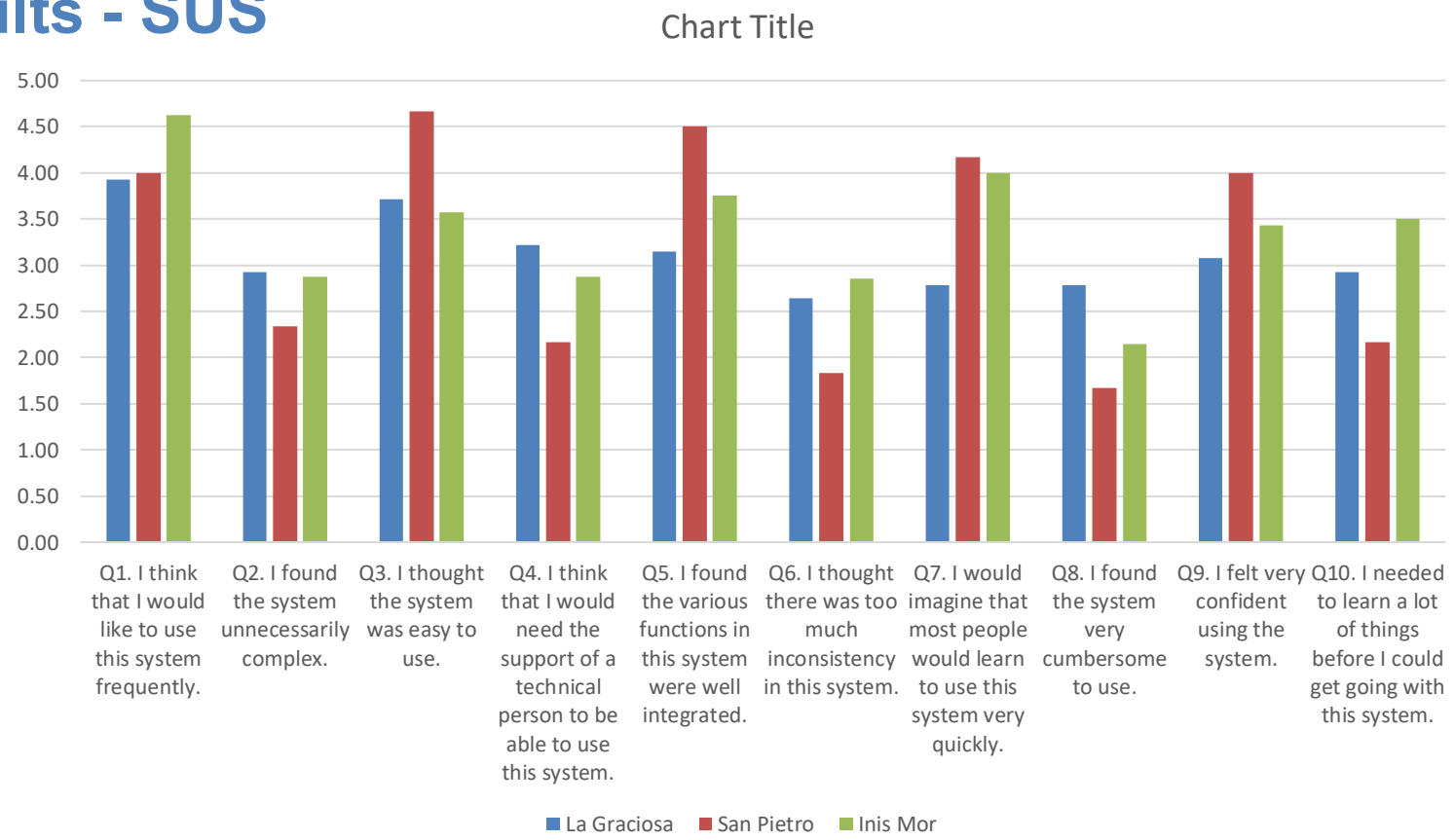
Results - TAM

- The results from TAM showed a positive attitude towards the REACT solution in all four areas explored by the survey in all three islands:
  - Perceived usefulness
  - Perceived Ease of Use
  - Attitudes Toward Technology Use
  - Intention to use

- Minor differences were encountered: participants from San Pietro were the more optimistic ones about the system while participants from La Graciosa were less positive



Results - SUS



- San Pietro respondents had the better opinion about the app. The perception from Inis Mor users was slightly better than in La Graciosa but still not as good as expected. The fact that some residents in Inis Mor knew about another app that helps in getting information about energy management in the dwellings might have to do soothing with these results as they have previous experience with another app.

Project website
https://react2020.eu/es/

LinkedIn
https://www.linkedin.com/company/react-2020-project/

Twitter
https://twitter.com/React2020

YouTube channel
https://www.youtube.com/channel/UCDPj1ebKXQyskcTPY5nB7BA

Facebook groups (Irish pilot in progress)
https://www.facebook.com/LaGraciosaREACT/
https://www.facebook.com/SanPietroREACT

You can contact us at
info@react2020.eu

THANK YOU FOR YOUR ATTENTION

REACT

Renewable Energy for
Self-Sustainable Island Communities

This project has received funding from the H2020 programme under Grant Agreement No. 824395

Masterpiece

Multidisciplinary Approaches and Software Technologies for Engagement, Recruitment and Participation in Innovative Energy Communities in Europe

Energy Community in complex contexts: the case of Berchidda, Sardinia, Italy

Cristina Barbero,
Berchidda Municipality

Sustainable Places 2024
24 September 2024
Luxemburg

SUSTAINABLE PLACES 2024

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101096836

Masterpiece

UNIVERSIDAD DE MURCIA

experientia
PUTTING PEOPLE FIRST

OdinS

Università Bocconi MILANO

R2M SOLUTION
RESEARCH TO MARKET

CERTH
CENTRE FOR RESEARCH & TECHNOLOGY HELLAS

RDI'UP

Uppsala kommun

Aix*Marseille université
Socialement engagée

TROYA CEVRE
ENVIRONMENTAL ASSOCIATION

Alec
AGENCE LOCALE DE L'ÉNERGIE ET DU CLIMAT
MÉTROPOLE BORDELAISE ET GIRONDE

Seinergy LAB

COMUNE DI BERCHIDDA

UEDAŞ

Sustainable innovation

The Partners

SUSTAINABLE PLACES 2024

Masterpiece

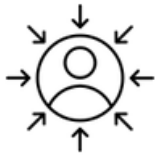
MASTERPIECE (Jan 23 - June 26)
aims to create a **digital coordination and cooperation modular platform** of services that will facilitate the creation and operation of energy communities.
The facilities given to members of the community to contribute to services and other developments will represent the distinction of the solution offered in this proposal, making it participative by design.

The Project

Masterpiece

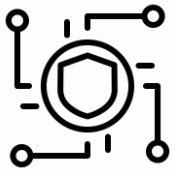
Innovation

To develop technical and social innovations to empower traditional energy consumers and to make them active agents of collaborative energy communities, paving the way towards a new energy market paradigm.



User-centric solution

To create user-centric solutions that based on participatory approaches such as co-creation and naturally accelerate citizens' involvement.



Cyber-security Infrastructure

To configure a standardized and sound cyber-security infrastructure so the active citizens are protected against cyber-attacks, at the same time that privacy is defended in accordance with the revised EPBD and the GDPR law.

The Project

Applicability and Replicability

To demonstrate the applicability and replicability of methodological, technical and business innovations in a variety of real-life pilots in different geographical locations, with heterogeneous social and economic environments and different regulatory/administrative frameworks.

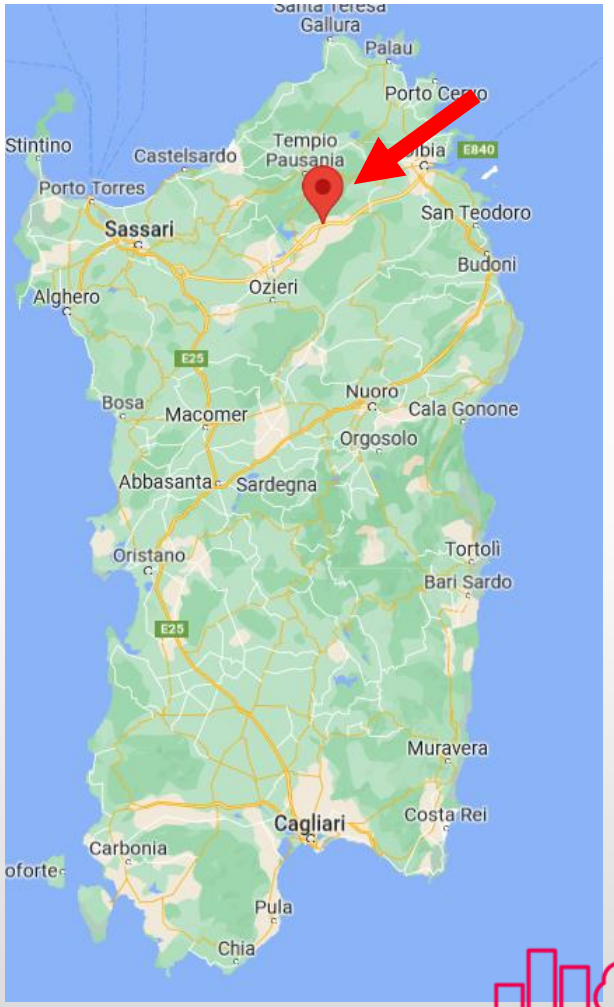
Business opportunities

To propose new business strategies and incentive mechanisms that activate the reactions of market participants craving for business opportunities that imply energy use and cost reduction.

The Project

Some technical data/aspects

- **REC not present but planned by City Council**
- The networks: ***80% owned by the Berchidda*** *(town centre and partly the countryside);* ***20% : ENEL*** *lines.* Berchidda is going to buy the 20% and being the only owner.
- 106 Private PV; 5 Municipality PV. Needs to build new PV plants for setting up REC
- **New Smart Meters (1500) installation started**
- Secondary cabin concentrators installed; 19 transformers.
- Operator-controlled cabins under renovation and **will be remotly controlled**



PV on private building

2668 inhabitants

the environment: current state

Regulations in Italy: New MASE decree approved. Operational rules active since Jan 24

MASE decree proposal	Tarif Incentive	Non-repayable subsidies
Tarif Incentive	For plants less than 1MW	Plants connected to the grid
Non-repayable subsidies	Municipalities >5k	Up to 40% for investments - new plants -Upgrading plants

The changes are mainly on the **calculation of the incentive** which becomes:

- dependent on the power of the system
- dependent on the ZONAL Single National Price
- reduced if in the presence of other financing ongoing (i.e. NextGenerationEU etc)

Source: www.mase.gov.it

SUSTAINABLE PLACES 2024

What we have done so far:

1. Smart meter installation started! (800/1500):

   - the mobile interfaces with the Merope program;
   - optical reader probe reads smart meters and gives power/voltage data

2. N. 9 substations completely renovated

   - New concentrators installed and equipped with Schneider device for telemetering

3. Public lighting will also soon be managed remotely
4. Questionnaires and public events to engage local population

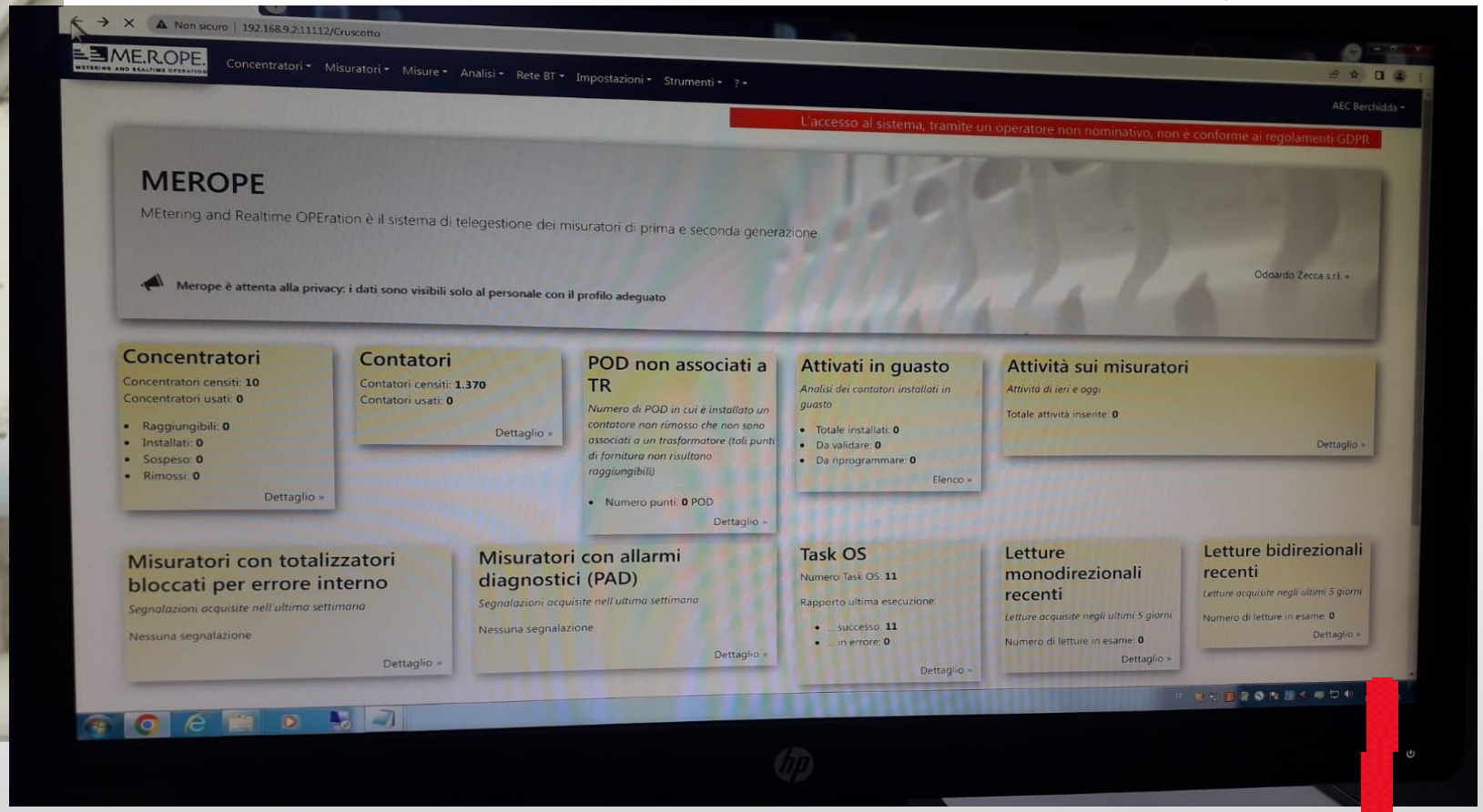
Concentrator

Modem

New Smart Meter installed

Probe


MEROPE
OpenVPN Connect
AnyDesk
Toccate per informazioni sul meteo
Galaxy Store
Galleria
Play Store
Google


Non sicuro | 192.168.9.2:11112/Cruscotto
ME.R.OPE.
Concentratori
Misuratori
Misure
Analisi
Rete BT
Impostazioni
Strumenti
AEC Berchidda
L'accesso al sistema, tramite un operatore non nominativo, non è conforme ai regolamenti GDPR
MEROPE
MEtering and Realtime OPEration è il sistema di telegestione dei misuratori di prima e seconda generazione
Merope è attenta alla privacy: i dati sono visibili solo al personale con il profilo adeguato
Odoardo Zecca s.r.l.
Concentratori
Concentratori censiti: 10
Concentratori usati: 0
Raggiungibili: 0
Installati: 0
Sospeso: 0
Rimossi: 0
Dettaglio »
Contatori
Contatori censiti: 1.370
Contatori usati: 0
Dettaglio »
POD non associati a TR
Numero di POD in cui è installato un contatore non rimosso che non sono associati a un trasformatore (tali punti di fornitura non risultano raggiungibili)
Numero punti: 0 POD
Dettaglio »
Attivati in guasto
Analisi dei contatori installati in guasto
Totale installati: 0
Da validare: 0
Da riprogrammare: 0
Elenco »
Attività sui misuratori
Attività di ieri e oggi
Totale attività inserite: 0
Dettaglio »
Misuratori con totalizzatori bloccati per errore interno
Segnalazioni acquisite nell'ultima settimana
Nessuna segnalazione
Dettaglio »
Misuratori con allarmi diagnostici (PAD)
Segnalazioni acquisite nell'ultima settimana
Nessuna segnalazione
Dettaglio »
Task OS
Numero Task OS: 11
Rapporto ultima esecuzione:
... successo: 11
... in errore: 0
Dettaglio »
Letture monodirezionali recenti
Letture acquisite negli ultimi 5 giorni
Numero di letture in esame: 0
Dettaglio »
Letture bidirezionali recenti
Letture acquisite negli ultimi 5 giorni
Numero di letture in esame: 0
Dettaglio »

Masterpiece

Groups of components & Mapping with the stages of an EC maturity journey

GROUP 1
Simulation & EC Management

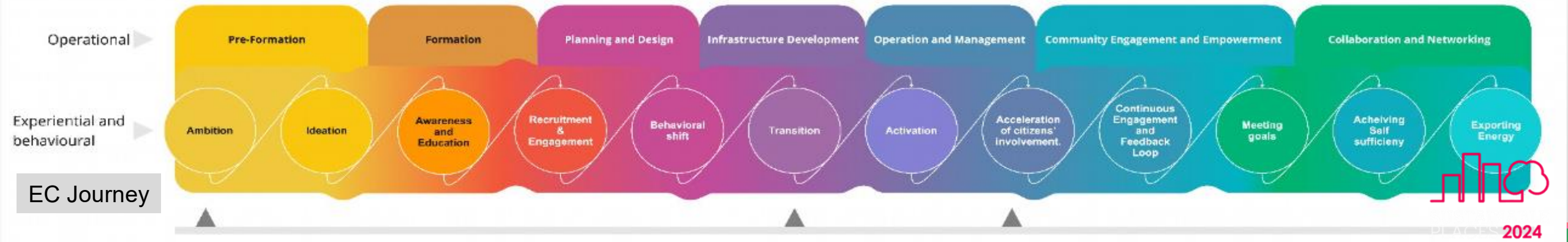
GROUP 2
Discovery, Awareness, Enrolment Engagement, and Profiling

GROUP 3
Flexibility, demand response and demand optimisation framework

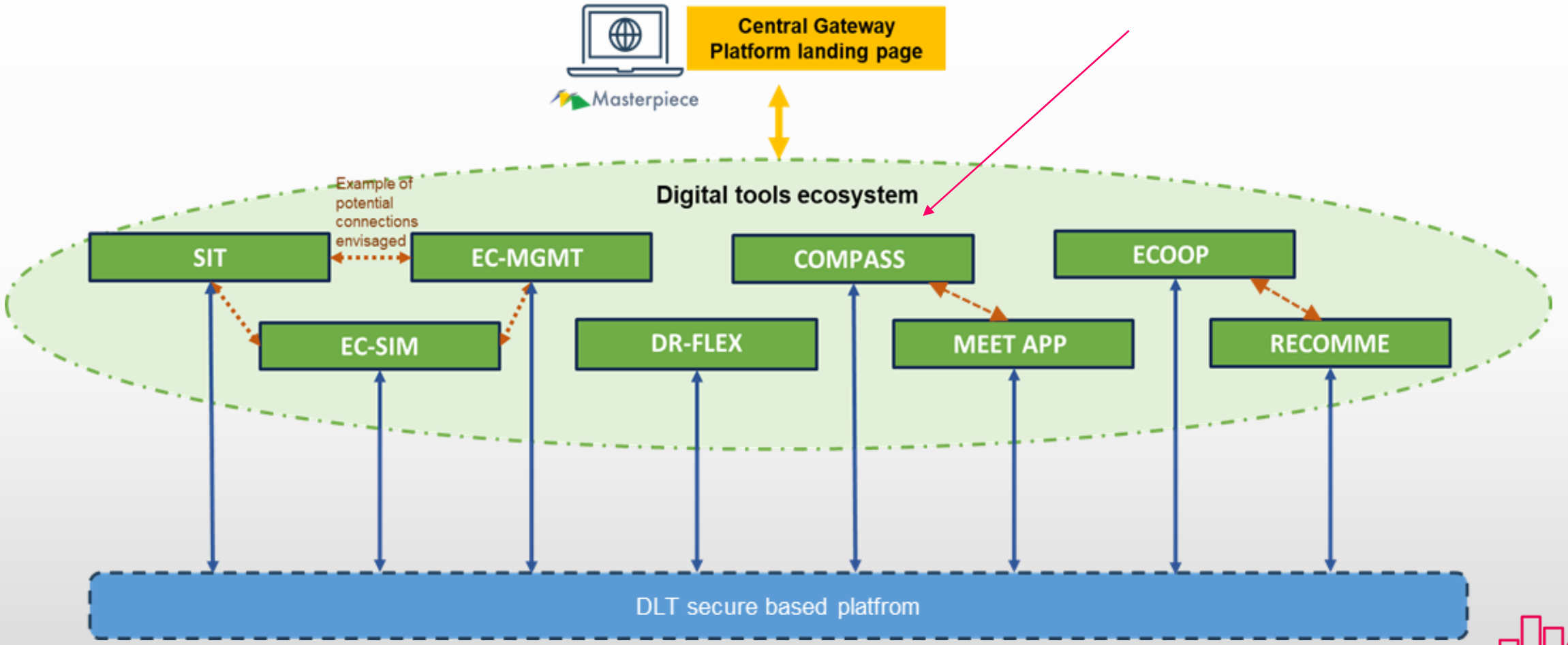
GROUP 1

GROUP 2

GROUP 3



MASTERPIECE's modular solution



COMPASS

About Resources Experts Contact

COMPASS connects citizens and communities with funding schemes and incentives, technical support, capacity-building activities, and resources for policy guidance and social impact to drive community energy projects forward.

Keywords > Category > EC Stage > Location > SEARCH

Search Incentives

Incentive #1
Italy

In Italy, the legislation on energy communities and collective self-consumption takes further steps forward.

Following the Conversion into law of Decree Milleproroghe 2020 of 30 December 2019, no. 162, and the publication of ARERA resolution no. 318/2020/R/eel of 4 August 2020, the Minister for Economic Development Stefano Patuanelli signed the MISE Decree on 15 September 2020, which identifies the incentive modalities for collective self-consumption groups and energy communities.

Incentive #2
Spain

El nuevo programa CE-IMPLEMENTA tiene como finalidad impulsar y desarrollar la figura de comunidades energéticas según lo establecido en la nueva componente 31 (Capítulo REPowerEU), Inversión 1 (Autoconsumo renovable, almacenamiento detrás del contador y comunidades energéticas) de la Adenda al Plan de Recuperación, Transformación y Resiliencia, que contempla las comunidades energéticas como un actor clave, dotando a estas entidades de la capacidad financiera necesaria para desarrollar las actividades de construcción y puesta en marcha de instalaciones vinculadas con la participación social en el sector energético. En paralelo, se ha considerado que el impulso de comunidades energéticas en zonas de reto demográfico es una vía para su desarrollo, por lo que esta convocatoria también contribuye al cumplimiento del objetivo CID 35 de la componente 2, inversión 4 "Proyectos de energía limpia en municipios con menos de 5 000 habitantes".

Incentive #3
Ireland

The Minister for Energy announced that small-scale and community projects generating power from solar and wind will receive increased financial incentives. Under the Small-Scale Renewable Energy Support Scheme (SRESS), farmers, small firms, and communities will benefit from more attractive fixed tariffs. The scheme offers three community rates and three SME rates for both solar and wind energy. Notably, grid-scale community solar projects will receive a guaranteed tariff 20% higher than the average community price from the last energy auction two years ago.

SRESS is crucial to the government's solar strategy and part of a broader framework for renewable self-consumers. It will provide support for renewable electricity installations that don't fit into other schemes like the utility-scale Renewable Electricity Support Scheme (RESS) and the Micro-generation Support Scheme (MSS), effectively bridging the gap between them.

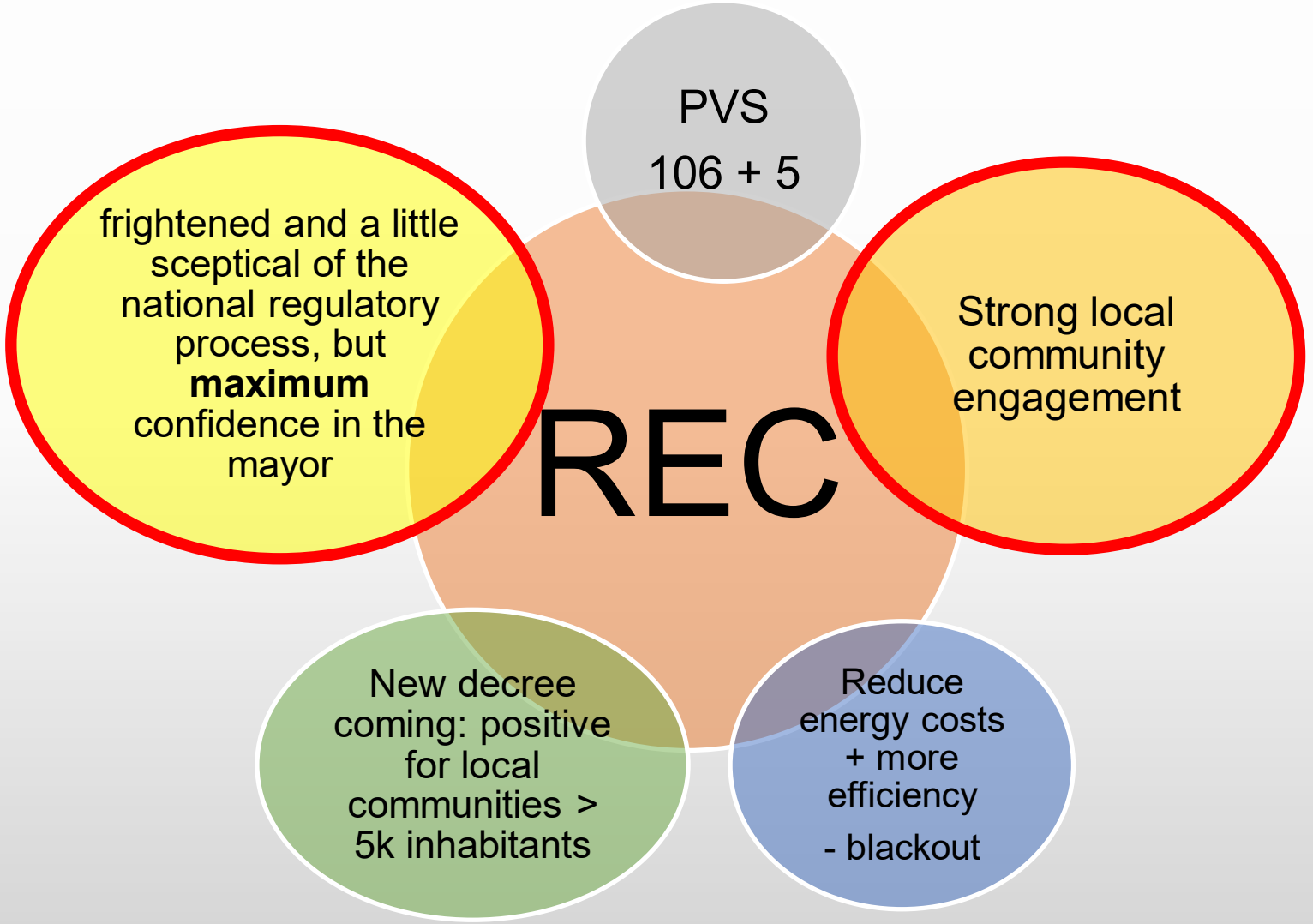
Some statistical data (ISTAT source)

YEAR	0-14	15-64	+65	TOT RESIDENTS	AVERAGE AGE
2020	273	1695	706	2674	48,5
2021	282	1643	711	2636	48,7
2022	272	1638	724	2634	49
• *Last official census 2011 – www.istat.it*					

2668 inhabitants

Gender	Degree	Diploma	Secondary School	Primary School	Alphapets	Illiterate
Male	57	271	555	324	77	8
Female	84	305	432	356	158	10
Tot	141	576	987	680	235	18

Results from the questionnaire/survey



What we have done so far: the selected scenarios

Social Cohesion

- Promoting Collaboration and Self-Consumption through PV Panels and Electric Vehicle Charging
- Facilitating Clean Energy Sharing and Active Participation in Renewable Energy Network

Behavioural and habitual energy shifts

- Achieving Sustainable Energy Transition and Equitable Access through Virtual Net Metering

What we want to do: Next Steps

- A case of about 100 (in the best scenario 200) smart meters will be chosen. the idea is to include the 3 typical profiles in a CE, i.e. consumer, producer and prosumer.
- It was agreed to extrapolate data such as:
  the amount of people consuming energy from each meter (mainly households).
  AEC can extrapolate this data anonymously to avoid privacy issues. Then each meter will be identified by its POD number and associated with the number of people living in that specific dwelling with that specific POD.
- Set up a meeting/workshop with EXP (end users, municipality staff, stakeholders etc)

Masterpiece

Multidisciplinary Approaches and Software Technologies for Engagement, Recruitment and Participation in Innovative Energy Communities in Europe

Thank You!

SUSTAINABLE PLACES 2024

This project has received funding from the European Union's Horizon Framework Programme for Research and Innovation under grant agreement no 101096836.

SUSTAINABLE PLACES 2024

RE-EMPOWERED
Renewable Energy EMPOWERing European & InDian Communities

Sustainable Places 2024
23-25 September 2024

RE-EMPOWERED Project

Kostas Karanasios, DAFNI Network of Sustainable Greek Islands

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This project has received funding from the European Union's Horizon 2020 research and innovation under grant agreement No 101018420.

DST@ 1971-2021 DEPARTMENT OF SCIENCE & TECHNOLOGY

Overview

RE-EMPOWERED
Renewable Energy EMPOWERing European & InDian Communities

Partners					
European			Indian		
1	ICCS - NTUA (European Coordinator)	Greece	8	Indian Institute of Technology Kharagpur (Indian Coordinator)	
2	Imperial College London	United Kingdom	9	Indian Institute of Technology Bhubaneswar	
3	Danmarks Tekniske Universitet	Denmark	10	Visvesvaraya National Institute of Technology	
4	Bornholms Varme As	Denmark	11	CSIR - Central Mechanical Engineering Research Institute	
5	Protasis Sa	Greece	12	Indian Institute of Science	
6	Deloitte Advisory, S.L.	Spain	13	Indian Institute of Technology Delhi	
7	DAFNI	Greece	14	Lab Concern India (LCI)	

Duration: 42 months as of 1 July 2021
Total Budget (EU): € 5 005 178,75

This work is financially supported by the European Union's Horizon 2020 Research and Innovation Program and the Department of Science and Technology (DST), India through the RE-EMPOWERED Project under Grant Agreement No 101018420 and DST/TMD/INDIA/EU/ILES/2020/50(c) respectively

Overview

RE-EMPOWERED
Renewable Energy EMPOWERing European & InDian Communities

The goal: Develop a set of solutions (ecoToolset) for efficient, decarbonised and RES-intensive multi-energy local energy systems.

The work: Exploit synergies among energy vectors, increasing demand flexibility through customer engagement

The role: Active stakeholder engagement via workshops, events and providing insights and information

The aim: Setting up energy communities and practice a bi-directional feedback to enable RE-EMPOWERED to tailor its solutions to specific needs of the pilots.

Overview

RE-EMPOWERED
Renewable Energy EMPOWERing European & InDian Communities

1st Pillar – Increased energy efficiency, RES utilization and reliability

2nd Pillar – Fostering sustainable and economic development

3rd Pillar – Exchange, replicability and scalability in EU and India

Demo sites

4 demo sites, in EU and India. Demos range in size and technical maturity.

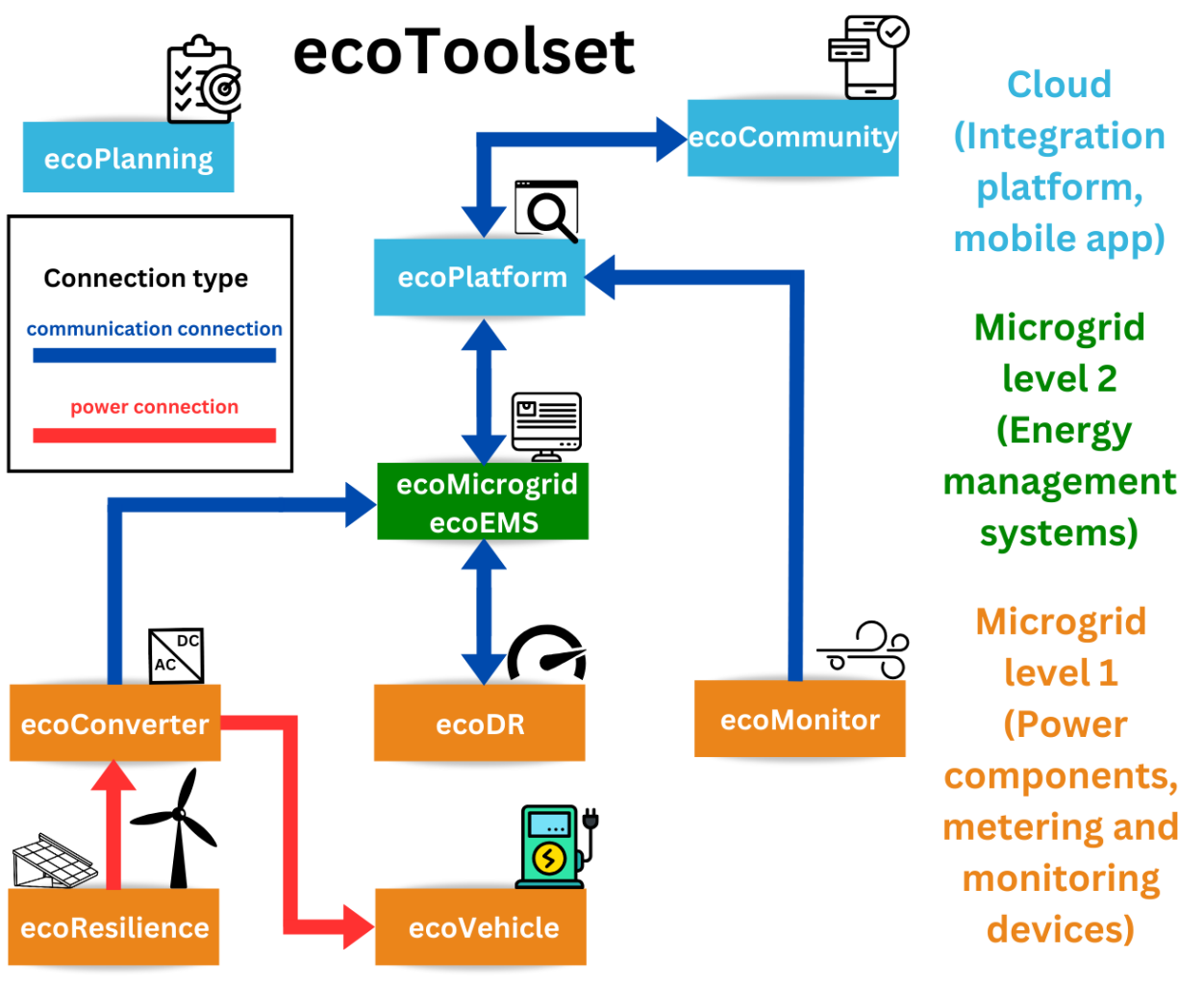
- ***Bornholm Island (Denmark):***
  - *Received the 2019 RESponsible Island Prize by the EC*
  - *Synergies of integrating energy vectors (power/heat) will be explored*
- ***Kythnos island (Greece):***
  - *Kythnos power system and Gaidouromantra microgrid (first microgrid in Europe)*
  - *Optimal operation and higher penetration of RES*
- ***Keonjhar (India):***
  - *Isolated rural Villages*
  - *Existing renewable facilities will be upgraded to improve the living standards of the community. Biomass and biogas will be integrated*
- ***Ghoramara Island (India):***
  - *Not interconnected island, residents live in very poor conditions, severe cyclonic storms every 5-10 years*
  - *Microgrid will be built to electrify more than 1000 houses of the island*

Ghoramara Island, West Bengal India

Bornholm island, Denmark


Kythnos island, Greece

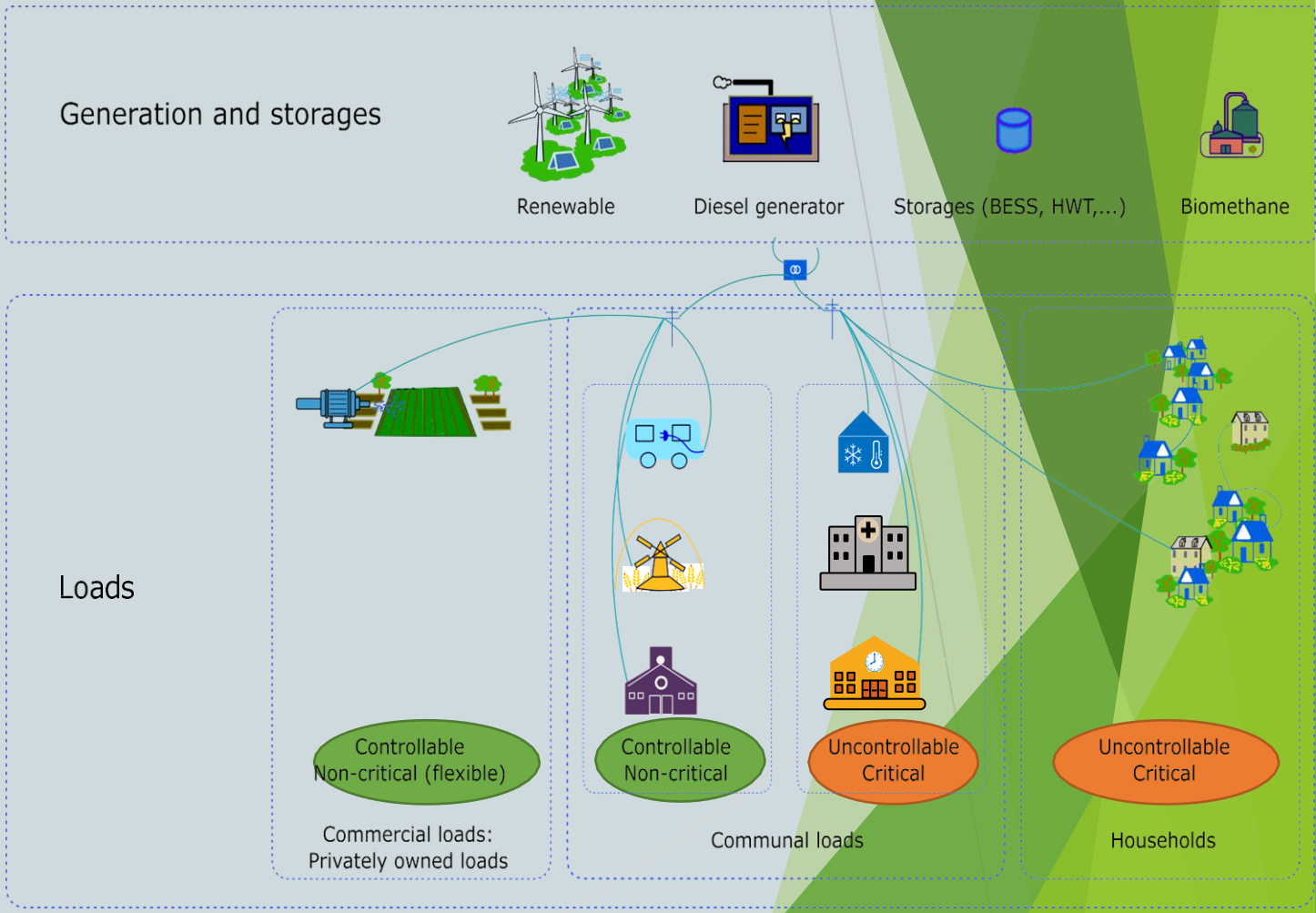
Ecotools



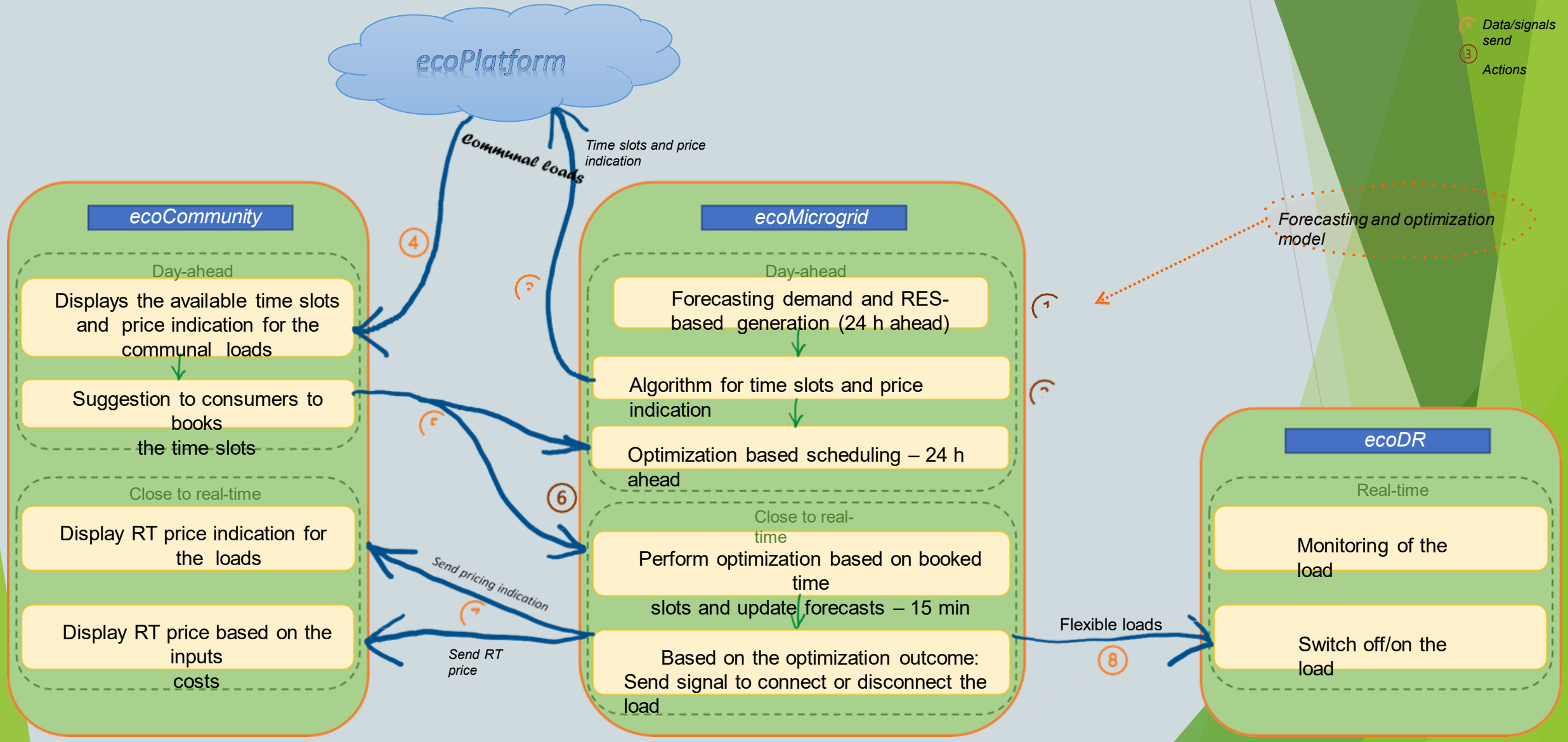
- ***ecoPlanning***: *Energy planning tool*
- ***ecoPlatform***: *Cloud-based interoperable platform*
- ***ecoCommunity***: *Citizen engagement digital platform*
- ***ecoEMS***: *Energy Management System for isolated and weakly interconnected systems*
- ***ecoMicrogrid***: *Energy Management System for smaller off-grid systems*
- ***ecoConverter***: *Power electronic converters for dc/ac microgrids*
- ***ecoDR***: *Smart Meter - Load controller*
- ***ecoMonitor***: *Air quality monitoring*
- ***ecoResilience***: *Cyclone Resilient infrastructure for wind turbines and PV*
- ***ecoVehicle***: *Electric vehicle charger*

Demand-side management (DSM)

- Demand-side management (DSM) supports the efficient operation of local energy systems and islanded microgrids
- Based on analysis of the RE-EMPOWERED demos, load classification has been performed
- DSM strategies have been tailored for all demo sites, containing
  - Day-ahead DSM planning based on algorithm generated **time slots**
  - Real-time DSM based on **price indications**
  - **Emergency actions** based on the microgrid optimization



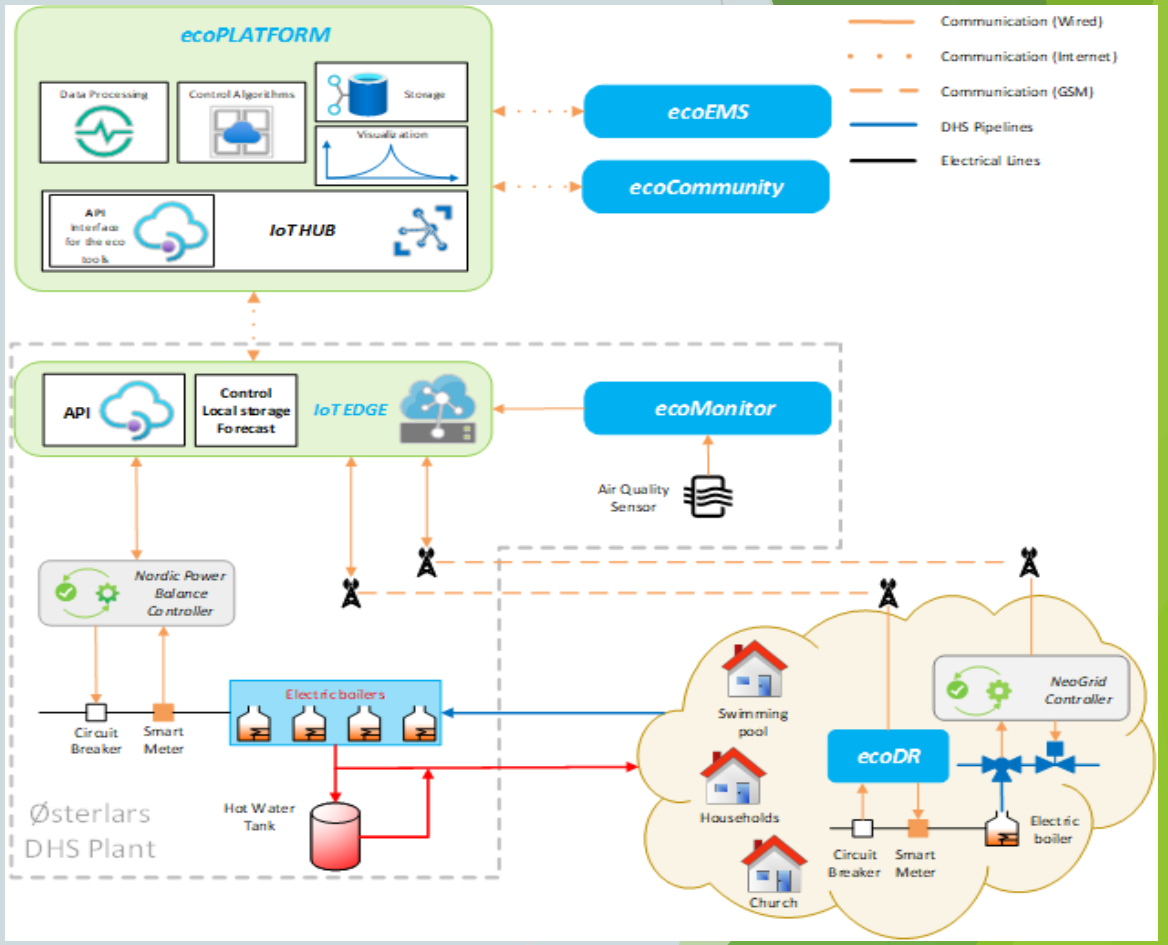
ecoTools interactions for DSM



Bornholm Island (Denmark)

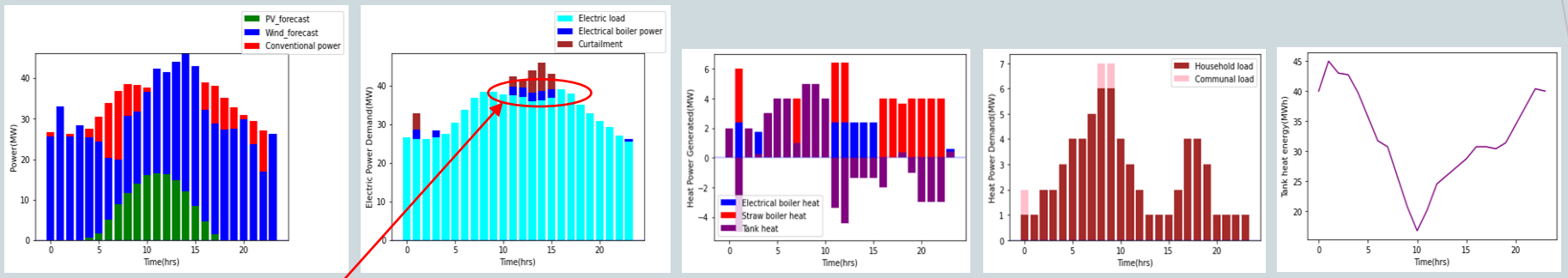
- Østerlars heat plant : 4 MW boiler fueled by locally produced straw, 4 0.6 MW electric boilers (EBs) for reserve and peak loads, and a 1,500 m3 hot water storage tank with a capacity of 80 MWh. Those are the heat sources that provide the heat to the local DHN.

- Electric Boilers will be activated when there is excess production from PV to avoid RES curtailment. The excess PV power will be provided as heat to the District Heating Network, leading to a reduction of the utilization of the straw boiler.

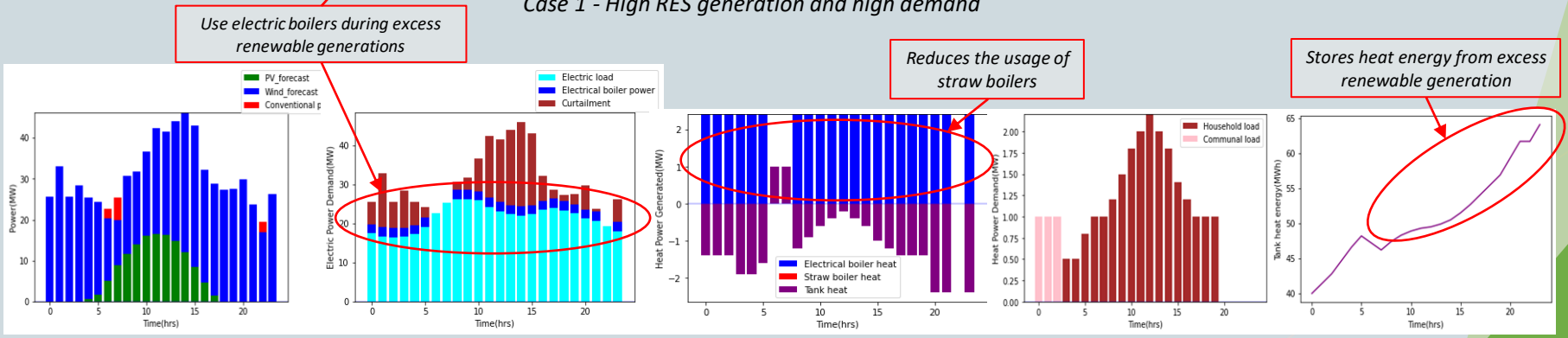


ecoEMS: Bornholm application

- **Simulation** -> The algorithms will be tested in the field next
- The objective is to **utilise the flexibility of the district heating network** to **reduce renewable curtailment** in the electrical system and **reduce the use of conventional generation.**



Case 1 - High RES generation and high demand



Case 2 - High RES generation and low demand

ecoEMS: Bornholm application

- The implementation of co-optimisations leads to the following advantages:
  - **Reduces renewable curtailment** during excess renewable generation
  - **Reduces the usage of straw boilers** by utilising the electric boilers
  - **Stores the heat energy** in the hot water tank during excess renewable generation
  - Effective utilisation of hot water storage and flexible heating demand to **minimise the operating cost**.

Table 1.1: Reductions in renewable curtailment, straw cost and emissions per day

Cases	*Case 1 (High load – High RES)*			*Case 2 (Low load – High RES)*		
Optimisation	*Independent*	*Co-optimisation*	***Change***	*Independent*	*Co-optimisation*	***Change***
Renewable Curtailment	42.7 MWh	25.9 MWh	**39.2 %** ▼	224.8 MWh	174.5 MWh	**22.4 %** ▼
Fuel cost of Straw boiler (EUR)	1146	846	**26.2 %** ▼	902	0	**100 %** ▼
CO_2 emissions from Straw Boiler (ton)	23.04	17.01	**6.03** ▼	18.14	0	**18.14** ▼
Gain in energy in the hot water tank (MWh)	0	0	-	0	23	**23** ▲

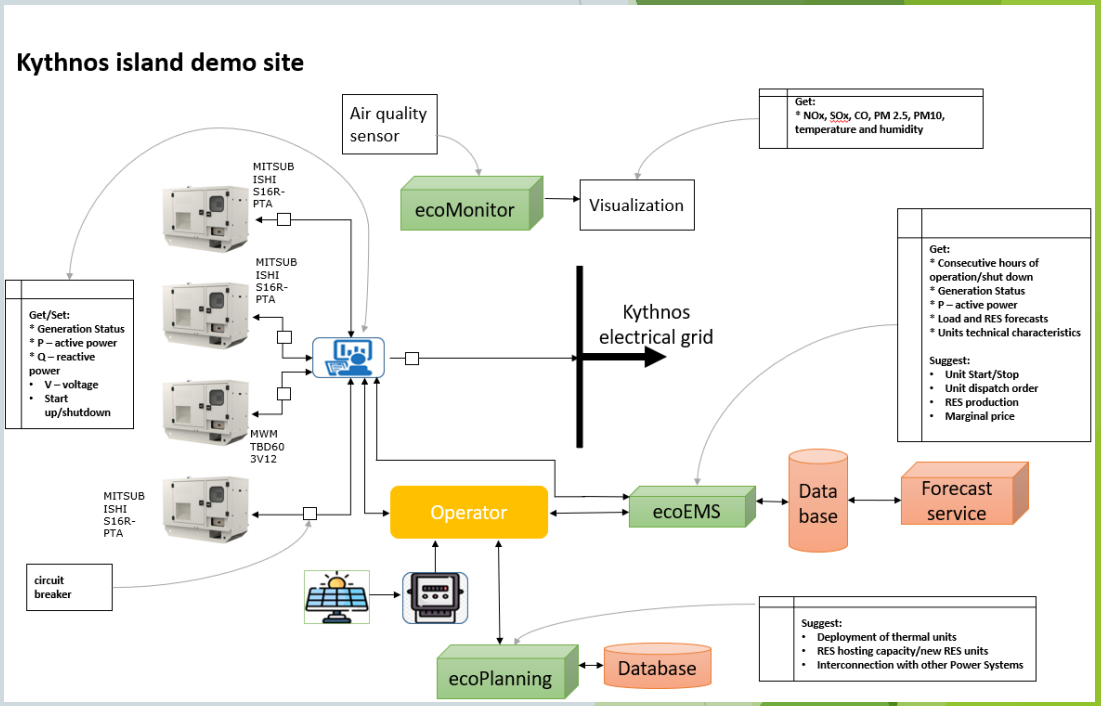
Approximate operational cost of Straw Boiler = 17.9 EUR / MWh
Approximate emissions of Straw Boiler = 360 kg CO_2 / MWh

Kythnos Island (Greece)

The Kythnos demo refers to the island's power system. A second site refers to the Gaidouromandra microgrid, which is an off-grid system.

Kythnos power system - electricity consumers: 3,353, peak load: 3.118 MW, Installed power - fossil fuel (diesel) : 5.2 MW , renewable energy: 0.9 MW.

- Optimized and efficient operation of the Kythnos power system, optimal dispatch of the generation units based on RES and load forecasting.
- Simulations that support decision-making regarding the deployment of new electricity generation units (conventional and renewable) including future interconnections.
- Monitoring of the air quality.



Overview of demo – Kythnos Power System

- Energy mix:
  - Peak load: 3.118 MW
  - No. of electricity customers: 3353
  - Installed capacity of diesel generation: 5.2 MW
  - Installed capacity of RE Generation units: 908.65 kW
    - 3 PV power plants: 238.26 kW
    - 2 Roof units: 5.4 kW
    - 2 Wind stations: 665kW
- The optimized and efficient operation is highly recommended for the island in order to reduce energy costs, to better manage the energy demand and finally increase the RES capacity.

Project Goals - Kythnos Power System

RE-EMPOWERED
Renewable Energy EMPOWERing European & InDian Communities

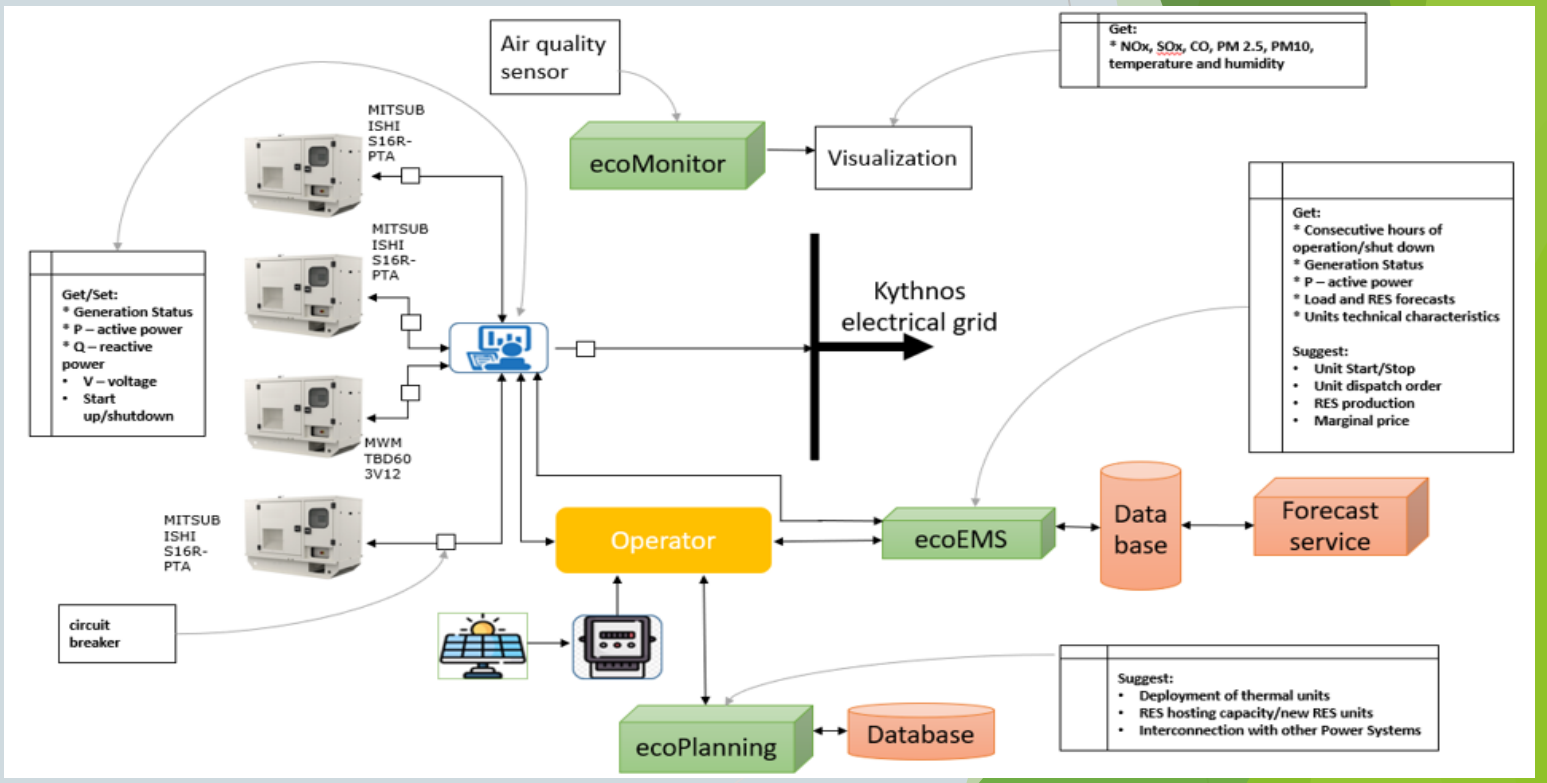
- Apply “smart” and efficient techniques and technologies for energy management:
  - ❖ Optimal management of available energy resources

  (achieve: increased renewable energy integration, cost reduction of energy production)

  - ❖ Innovative Demand Response techniques

    (achieve: engagement of local energy prosumers, development of new attractive business cases)

- Establish community engagement on the island to maximize the local benefit and accelerate the clean energy transition of Kythnos in a socially inclusive way.
- Use Kythnos case as prototype to investigate the replicability in all NII of Greece.



ecoDR: Application in Kythnos Island

- ecoDR will communicate with ecoMicrogrid to foster demand-side management and implements the control schedule of an air-condition, installed at the system house (microgrid control room)
- Development Phase completed
- Testing completed and accuracy evaluated
- Communication interface with ecoMicrogrid tested (remote tests)
- The tool will be dispatched from India to Kythnos

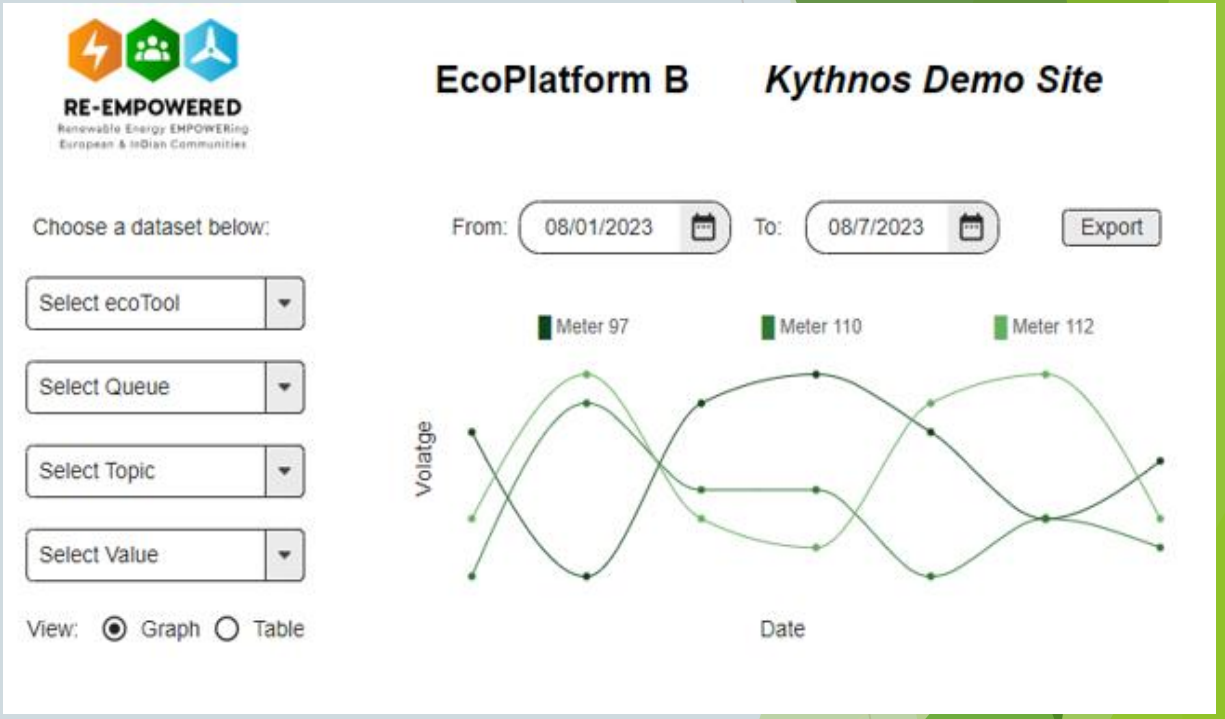
EcoDR : Developed meters

ecoPlatform: Application in Kythnos Island

Eco Platform will be utilized to enhance the interoperability and control of distributed energy resources. Its core functionality includes communication and database management while being user-friendly for the public.

Achievements

- Development and testing completed
- Service operating in ICCS-NTUA virtual machine server
- Integrated with almost all relevant ecoTools



Mockup of ecoPlatform-B's front-end

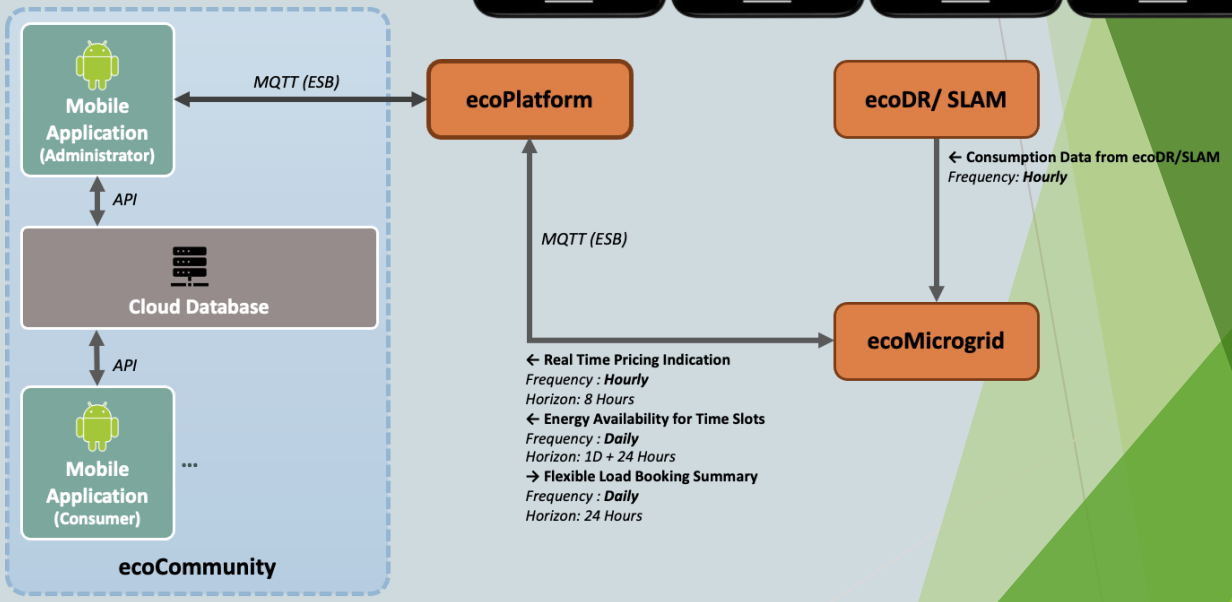
ecoCommunity: Application in Kythnos Island

RE-EMPOWERED
Renewable Energy EMPOWERing European & InDian Communities

ecoCommunity is a digital platform that will promote community engagement at Gaidouromantra

Modules Deployed

- Energy Consumption
- Variable Pricing Indication
- Load Booking
- Problem Reporting
- Forum
- Help

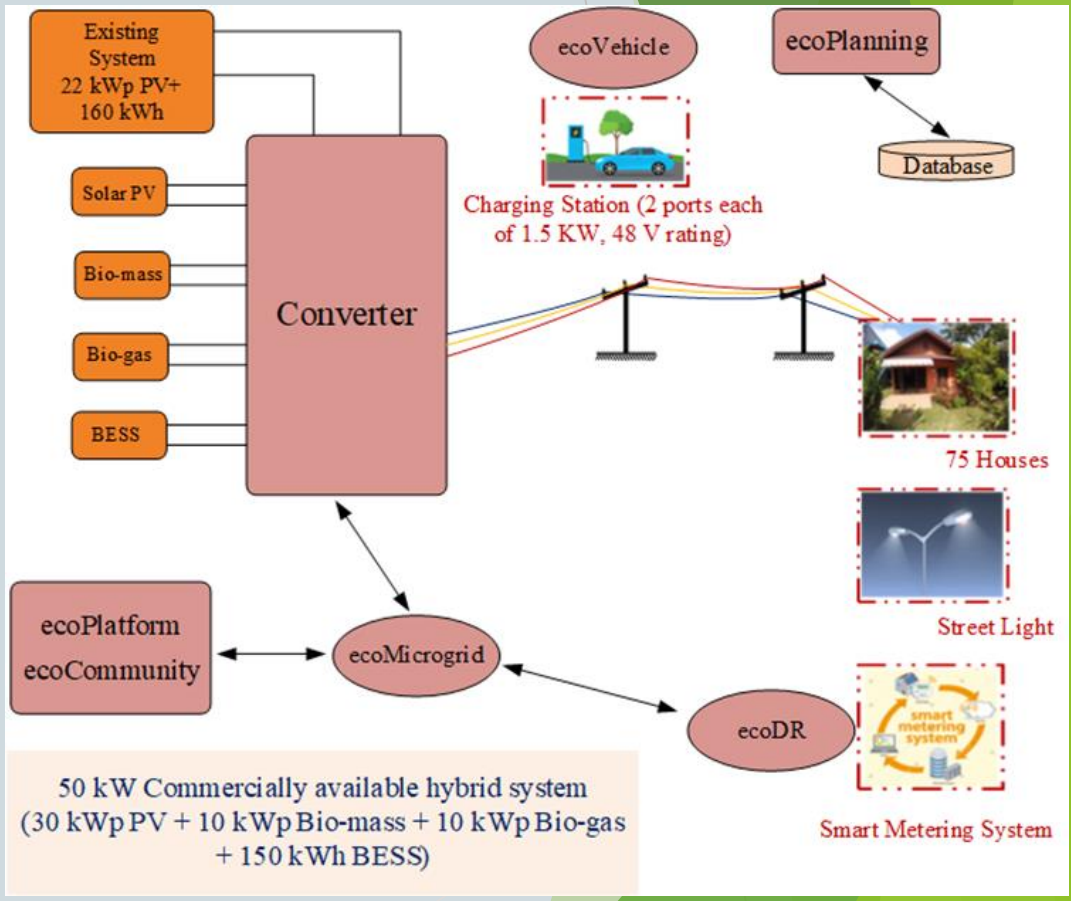


Achievements

- Cloud database hosted on a Frankfurt server
- Greek translation of the UI text completed
- Demo site specific mobile APK developed
- Data exchange with ecoMicrogrid is tested
- Initially deployed on the mobile phones of the demo site leaders and administrators

Keonjhar(India)

- The demo site of Keonjhar is an existing microgrid of 22 kWp, which primarily supplies consumers during nighttime with limited capacity. As a part of the RE-EMPOWERED project, it will be upgraded by additional 50 kWp to support commercial applications.
- 50 kW microgrid system: 30 kWp PV + 10 kW Biomass + 10 kW Biogas.
- Charging Facility for three wheelers, Smart Meters , Solar Dimmable Lights, Optimization, demand side management, community engagement.
- Development and demonstration of energy sources integration, by means of high energy efficient converters and their control.
- Implemention of a livelihood program in selected remote villages, aiming to create support ecosystems to promote income-generating energy uses in agriculture and small businesses.
- Increase of population awareness and customer engagement, to minimize rural to urban migration.



Ghoramara island (India)

Population of 3,000.

Energy sources added in Ghoramara island to provide electricity to 1100 houses along with school, shops and health center:

PV 240 kWp, Wind Turbine 10 kWp.

-2 larger microgrids (155 kW + 75 kW) using commercial equipment.

-1 microgrid (20kW) using RE-EMPOWERED developed technologies.

Several power electronic devices will be developed/installed:

- Partial Power Converter to integrate PVs (for higher capture of solar energy during partial shading)
- SiC based dc-dc converter to integrate BESS
- Load Flow Controller to transfer power between 2 microgrids
- Power Conditioner multilevel converter

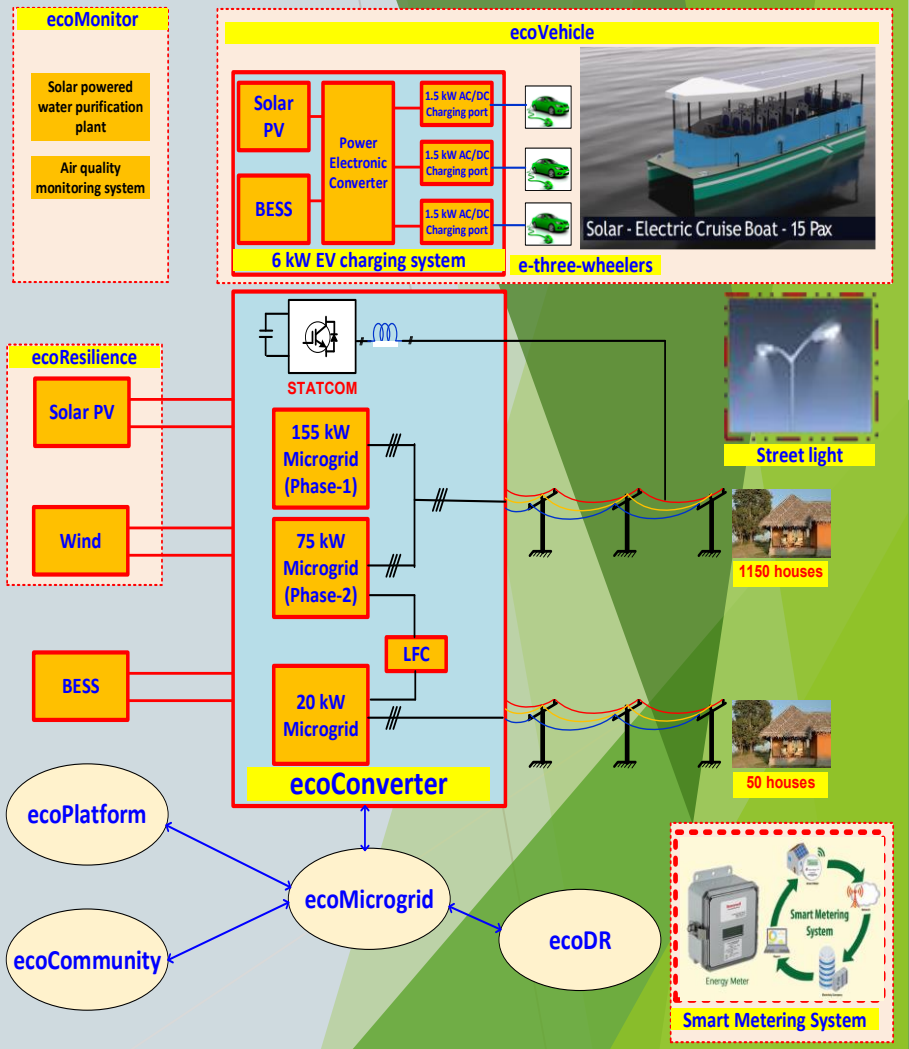
Charging station with local PV and BESS for electric three wheelers

Electric boat to carry 15 passengers

Dimmable street lights

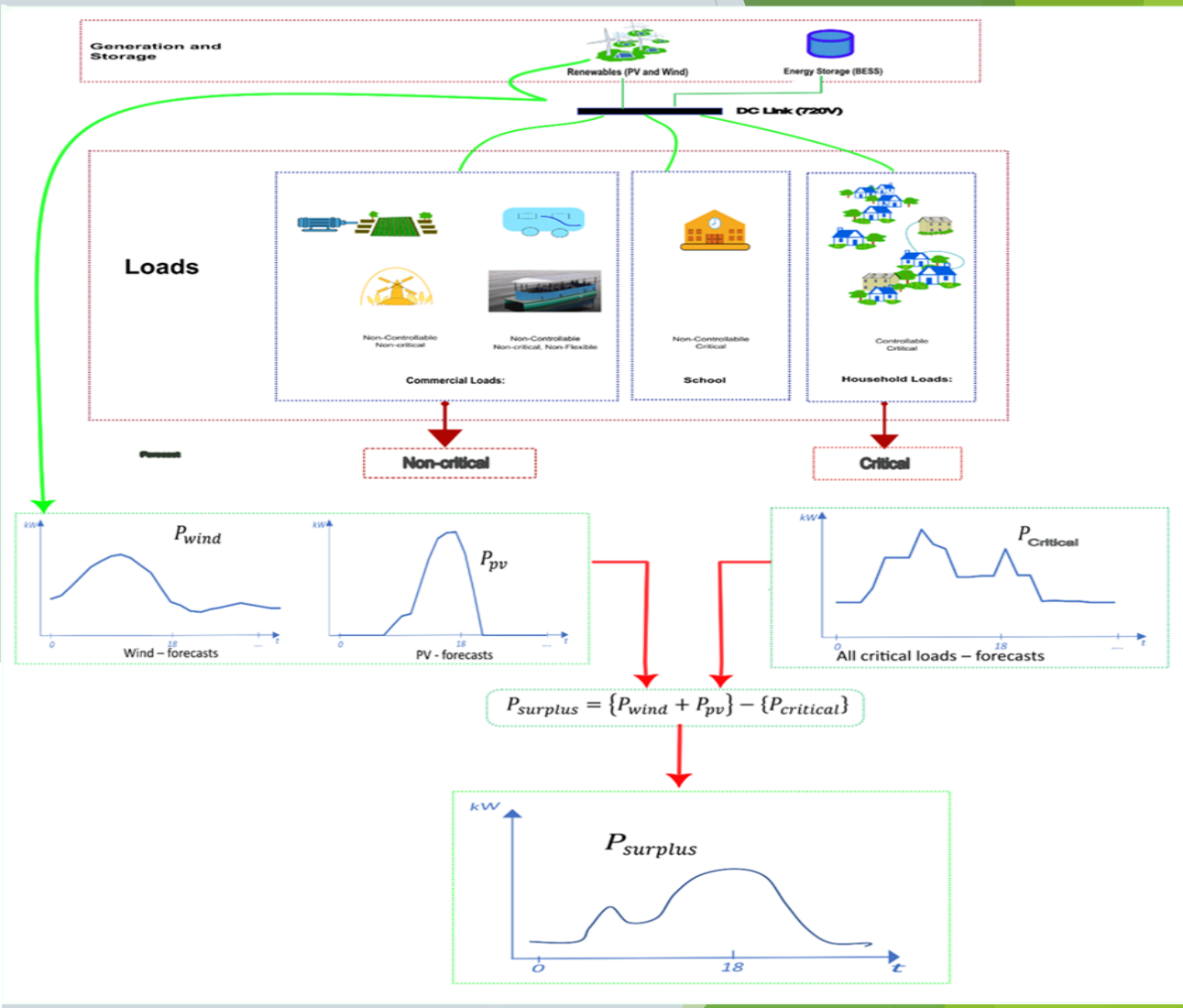
Cyclone resilient structure for PVs and Wind Turbine

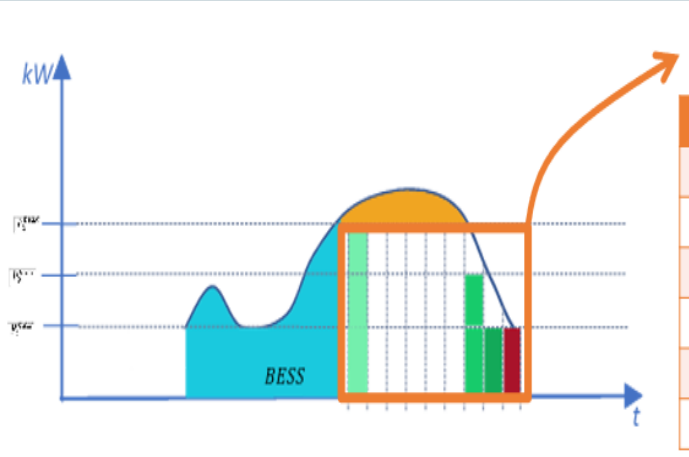
Special focus on optimization, demand side management, community engagement.



DSM: Ghoramara island application

- Forecasts of RES and critical loads for 24 hours ahead.
- ecoMG provides time slots and price indications
- ecoMG sends time slots and available units that can be activated during the time slots
- ecoCommunity displays available time slots and price indications and provides suggestions to consumers about when to block the time slots.





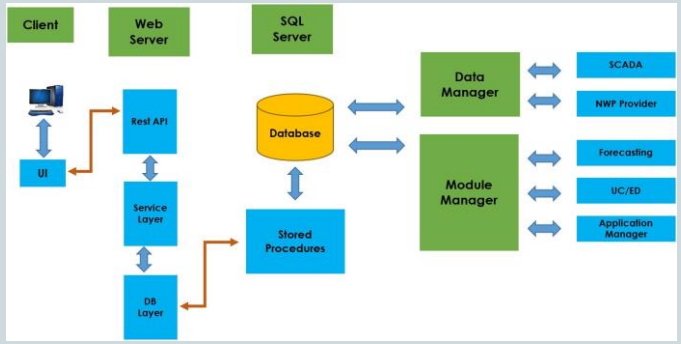
Send time slots and number of units to ecoCommunity

Time (h)	Color	Units
11	Green	3
12	Green	3
....	.....	.....
17	Green	2
18	Green	1
19	Red	-

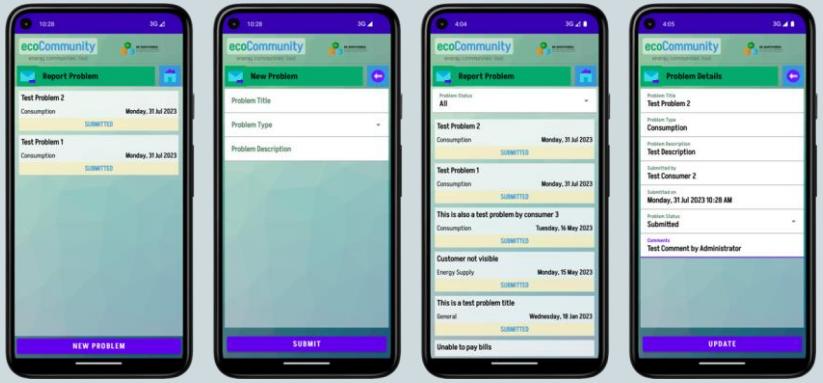
Summary of achievements

Tools development has been almost completed

ecoEMS

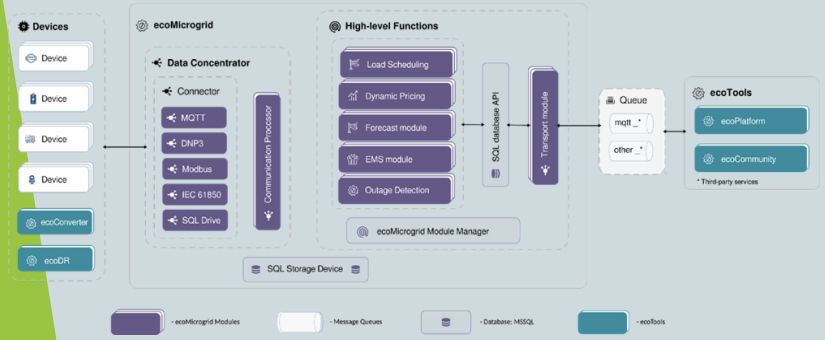


ecoCommunity



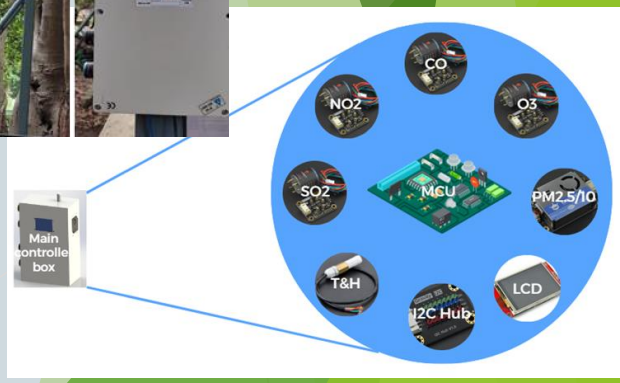
ecoDR

ecoMicrogrid



ecoResilience

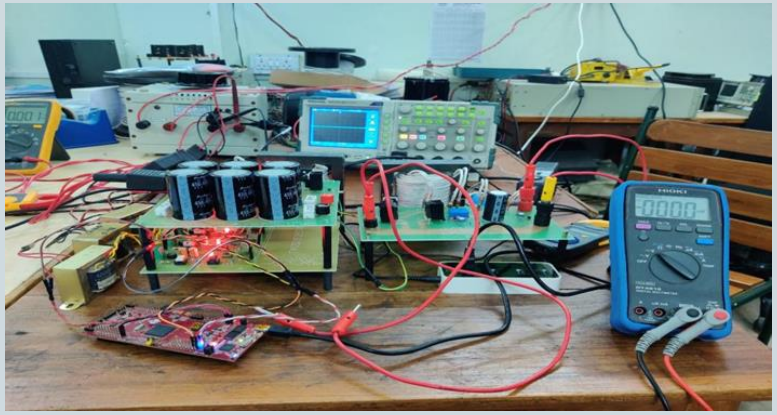
ecoMonitor



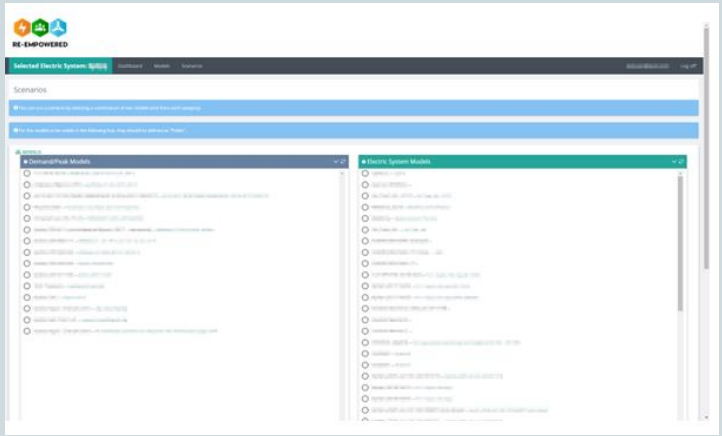
Summary of achievements

Tools development has been almost completed

ecoVehicle

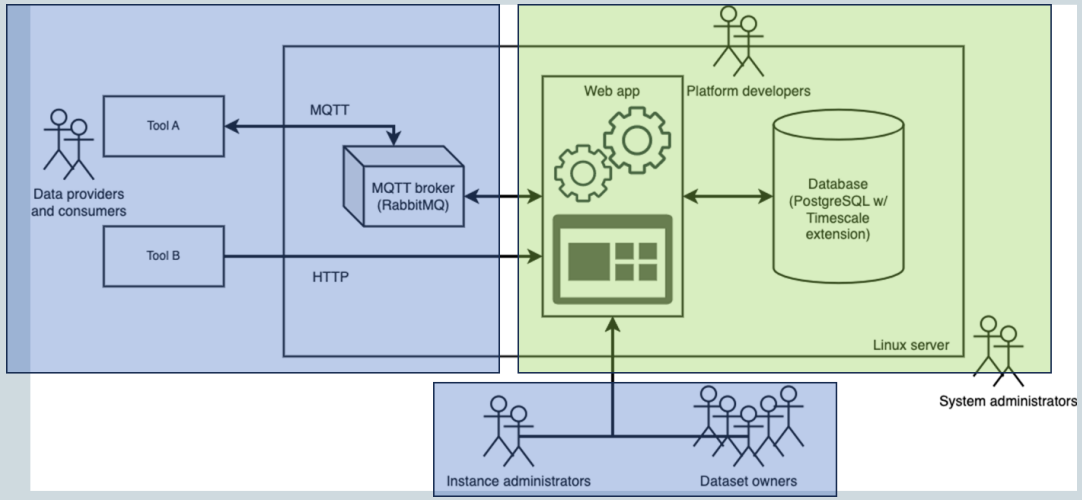


ecoPlanning



ecoConverter

ecoPlatform



Summary of achievements

- *RE-EMPOWERED was presented in more than 30 events across Europe and India*
- *8 scientific papers have been published in scientific journals & magazines (EPSR, Energies, IEEE Transactions on Energy Conversion etc)*
- *9 scientific papers have been published in conference proceedings*
- *1 scientific paper was awarded the Best Conference Papers Award at the IEEE PES General Meeting*
- *Indian demo sites Ghoramara island and Keonjhar, were used as case studies for the student projects of the Off-Grid Energy Systems course of the Technische Hochschule Ingolstadt (THI) University*
- *1 exploitation workshop was organized*
- ***6 research visits (knowledge exchange) have been executed (4 until end of 2022 and 2 in 2023). Several more are planned***
- ***2 intercontintental consortium meetings and site visits (February 2024 – India / June 2024 – Greece)***
- ***Creation of an Cooperative Society in Keonjhar***
- ***Electricity provided to approximately 4000 residents in Indian demo sites***

Thank you for your attention!

RE-EMPOWERED

Renewable Energy EMPOWERing
European & InDian Communities

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