



RE-EMPOWERED

Renewable Energy EMPOWERING
European & INdian Communities

2nd Exploitation Workshop

RE-EMPOWERED Project Overview and Main achievements

Panos Kotsampopoulos, ICCS-NTUA

4th Dec. 2024



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



This project has received funding from the Department of Science and Technology (DST), India under Grant Agreement № DST /TMD/INDIA/EU/ILES/2020/50(c)

Overview of the RE-EMPOWERED project



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

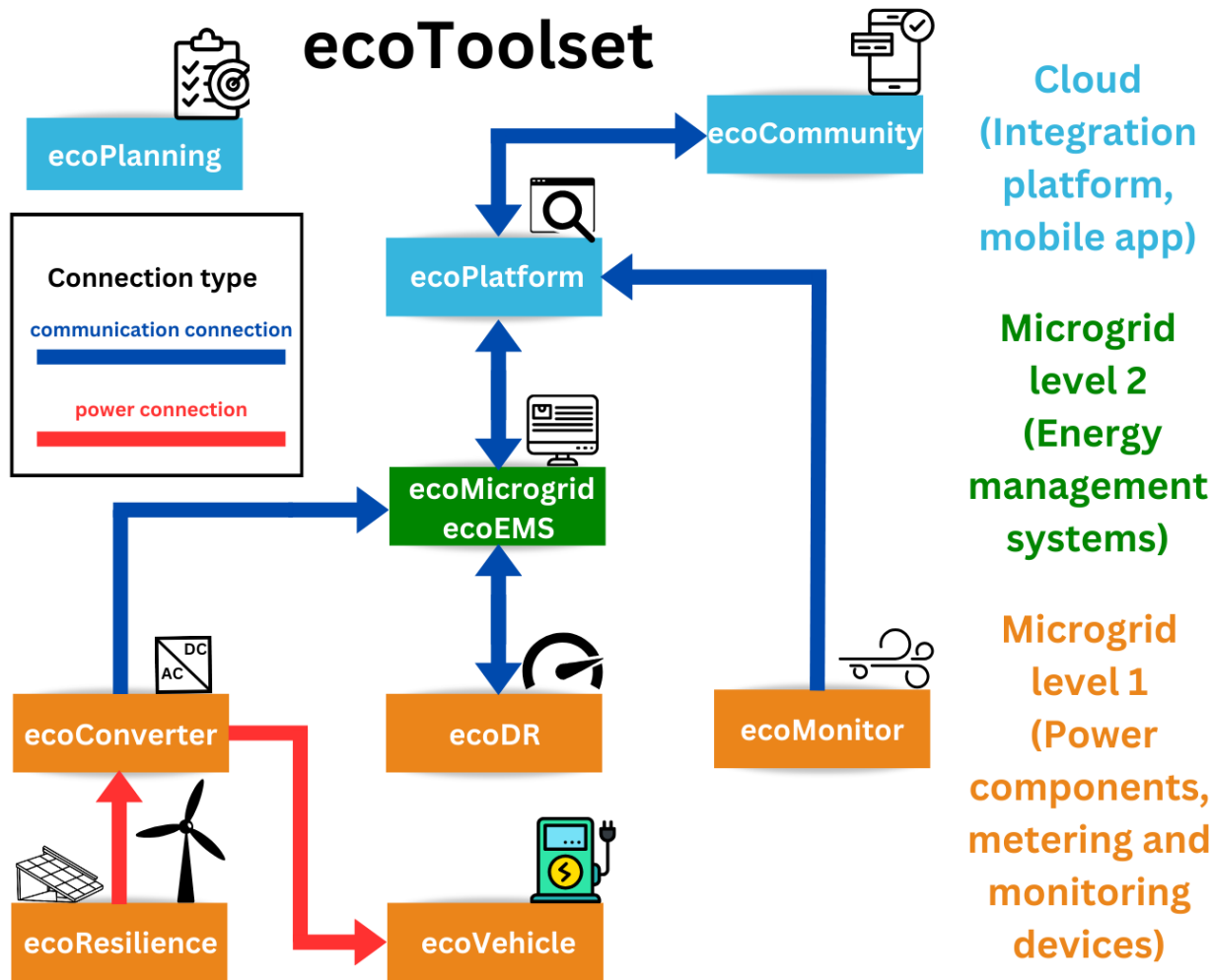
This work is financially supported by the European Union's Horizon 2020 Research and Innovation Program and the Department of Science and Technology (DST), India through the RE-EMPOWERED Project under Grant Agreement No 101018420 and DST/TMD/INDIA/EU/ILES/2020/50(c) respectively



ecoTools and architecture



RE-EMPOWERED
Renewable Energy EMPOWERing
European & Indian Communities

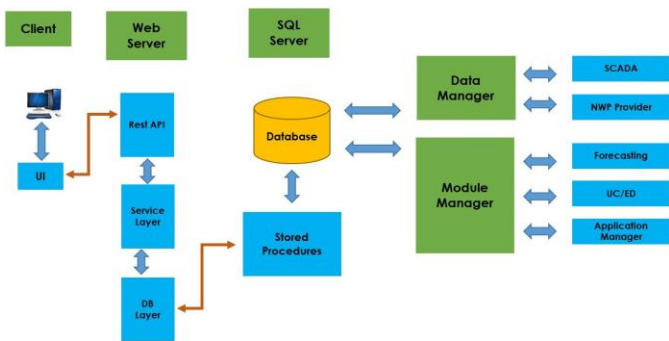


- **ecoPlanning**: Energy planning tool
- **ecoPlatform**: Cloud-based interoperable platform
- **ecoCommunity**: Citizen engagement digital platform
- **ecoEMS**: Energy Management System for isolated and weakly interconnected systems
- **ecoMicrogrid**: Energy Management System for smaller off-grid 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

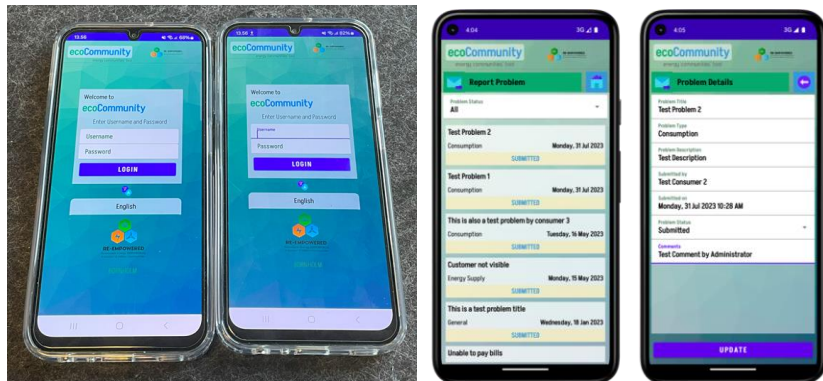
ecoTools

The ecoTools have been developed, lab tested, deployed and demonstrated at the demo-sites

ecoEMS



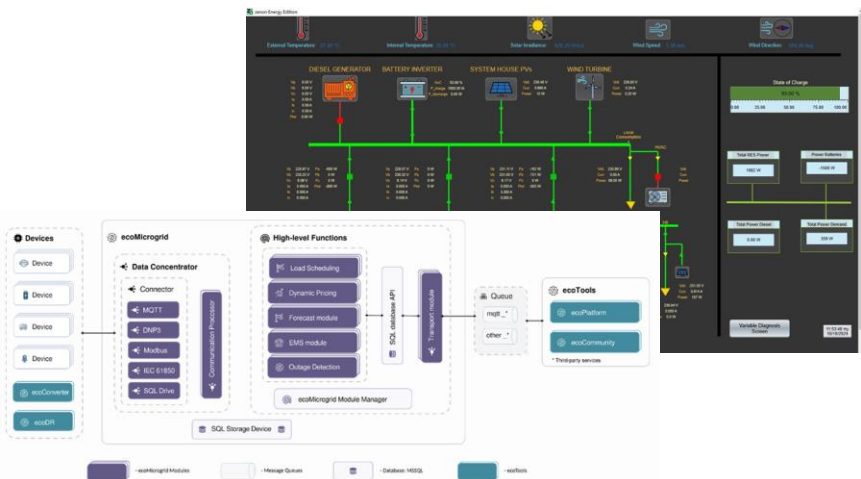
ecoCommunity



ecoDR



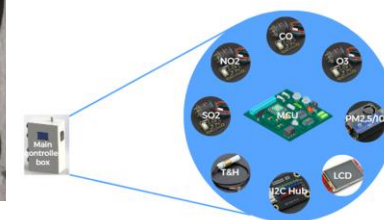
ecoMicrogrid



ecoResilience



ecoMonitor



ecoTools



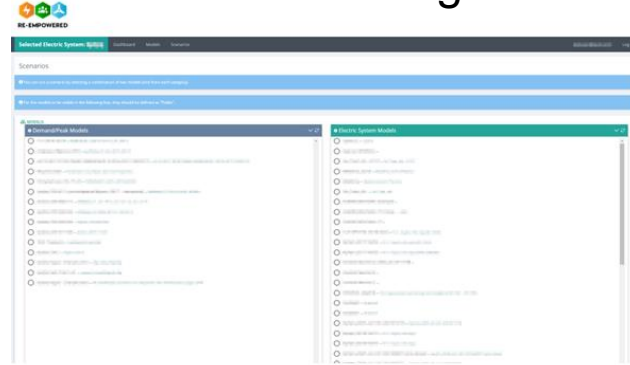
RE-EMPOWERED
Renewable Energy EMPOWERing
European & Indian Communities

The ecoTools have been developed, lab tested, deployed and demonstrated at the demo-sites

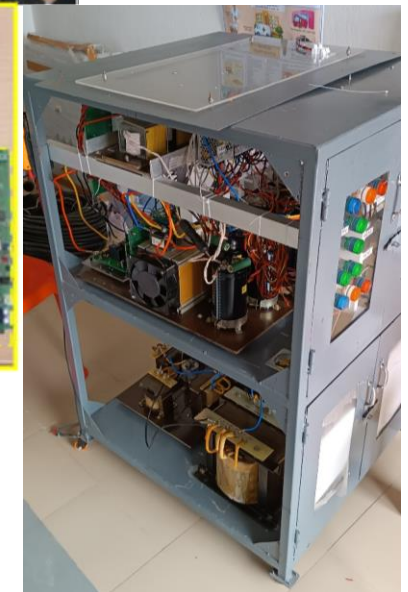
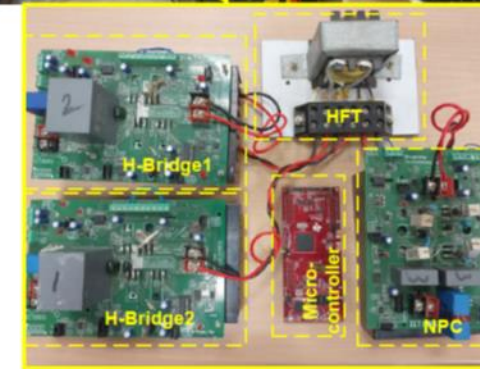
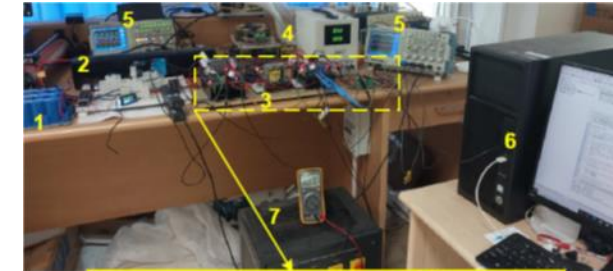
ecoVehicle



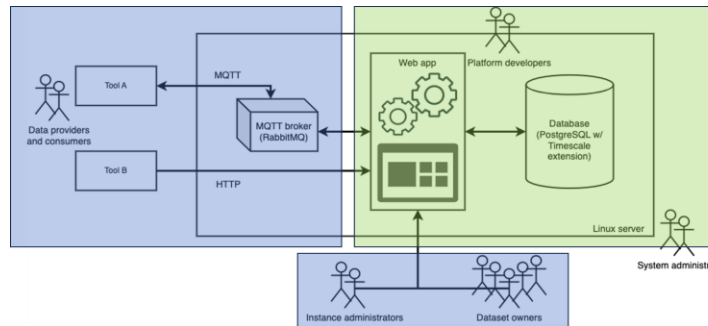
ecoPlanning



ecoConverter



ecoPlatform



ecoPlatform Home Datasets Providers Users

Dataset Details Datasets Alarms Owners Add dataset Export

consumer_consumption

ID	Name	Description	Min value	Max value	Max silence (seconds)	Latest datapoint	Features	
51	22895_RETURN_TEMPERATURE	Temperature at heat meter - Return	0.0	100.0		2024-10-09 23:30:00	data_meter:BV physical_unit:C sensor_name:BV	Edit Delete Export
52	22895_FLOW_TEMPERATURE	Temperature at heat meter - Supply	0.0	100.0		2024-10-09 23:30:00	data_meter:BV physical_unit:C sensor_name:BV	Edit Delete Export
53	22895_ENERGY	Energy consumption - Accumulated values				2024-10-09 23:30:00	data_meter:BV physical_unit:MW sensor_name:BV	Edit Delete Export
54	22895_RETURN_TEMPERATURE	Temperature at heat meter - Return	0.0	100.0		2024-10-05 20:45:00	data_meter:BV physical_unit:C sensor_name:BV	Edit Delete Export



Project demo sites



RE-EMPOWERED
Renewable Energy EMPOWERing
European & Indian Communities

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

- **Bornholm Island (Denmark)**
- **Kythnos island (Greece)**
- **Keonjhar (India)**
- **Ghoramara Island (India)**



**Ghoramara Island, West Bengal
India**



Kythnos island, Greece



Bornholm island, Denmark

Bornholm demo site (Denmark)



RE-EMPOWERED
Renewable Energy EMPOWERing
European & Indian Communities

Video presentation. Find out more in our YouTube channel: @RE-EMPOWEREDEUIndiaProject



18 MWh 2023 production from
430000 tones of local straw



Gaidouromandra/Kythnos demo site (Greece)



RE-EMPOWERED
Renewable Energy EMPOWERing
European & Indian Communities

Video presentation. Find out more in our YouTube channel: @RE-EMPOWEREDEUIndiaProject

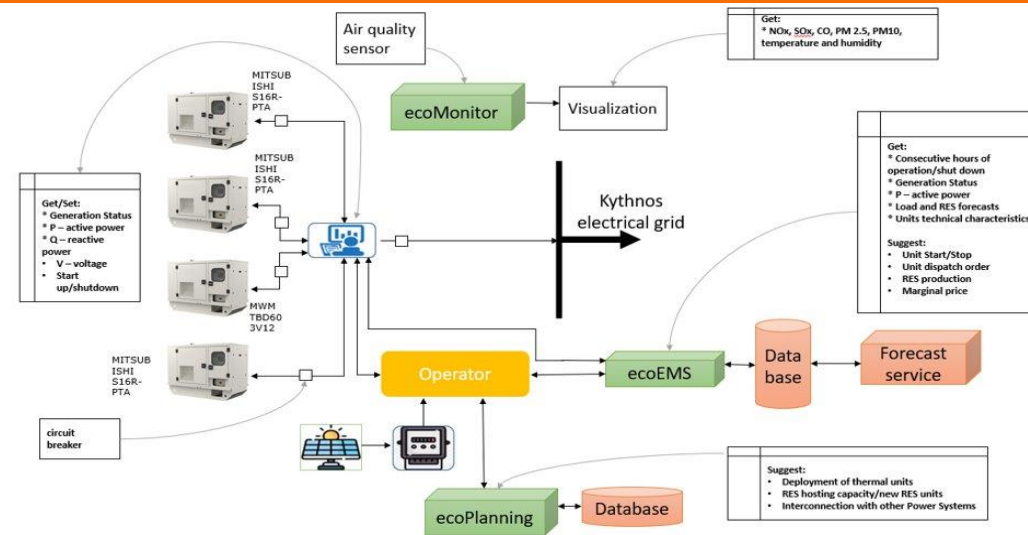


Gaidouromandra/Kythnos demo site (Greece)



RE-EMPOWERED
Renewable Energy EMPOWERing
European & Indian Communities

- **Kythnos power system:** non-interconnected island. Optimal management of available energy resources in order to reduce operational costs, better manage the energy demand and finally increase the RES capacity (ecoEMS)

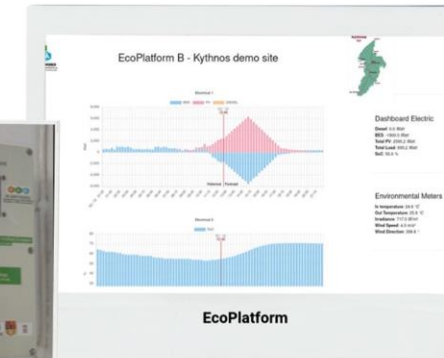


Gaidouromantra Microgrid:

- SCADA+EMS for optimized operation (ecoMicrogrid)
- Smart meter/load controllers for DSM (ecoDR)
- Cloud-based platform to collect and manage operating data (ecoPlatform)
- Smart phone App for citizen engagement and DSM (ecoCommunity)
- Small wind turbine, manufactured by NTUA students, (ecoResilience)



EcoMicrogrid



EcoPlatform



EcoResilience



EcoMonitor



EcoDR

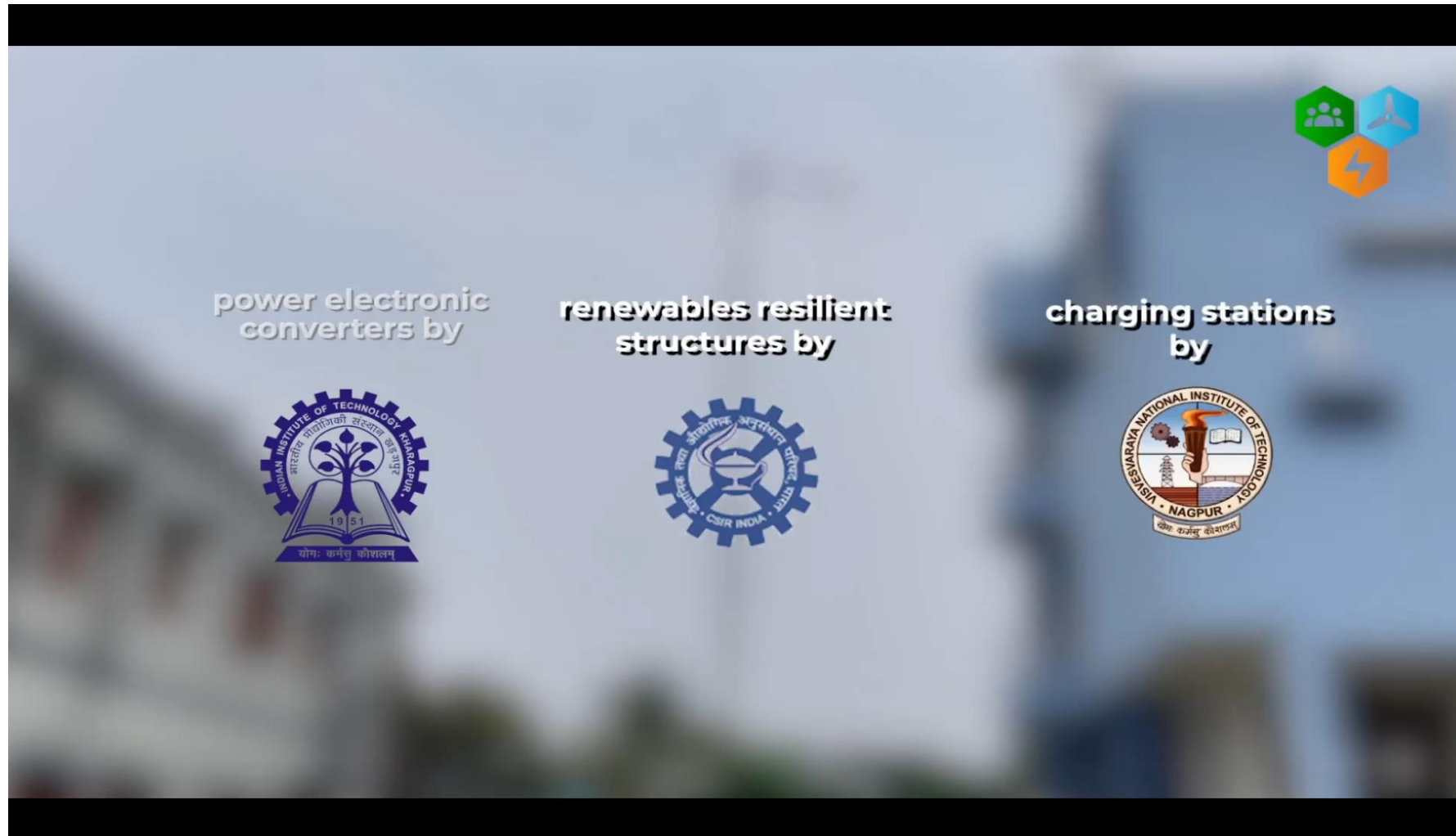


Ghoramara island (India)



RE-EMPOWERED
Renewable Energy EMPOWERing
European & Indian Communities

Video presentation. Find out more in our YouTube channel: @RE-EMPOWEREDEUIndiaProject

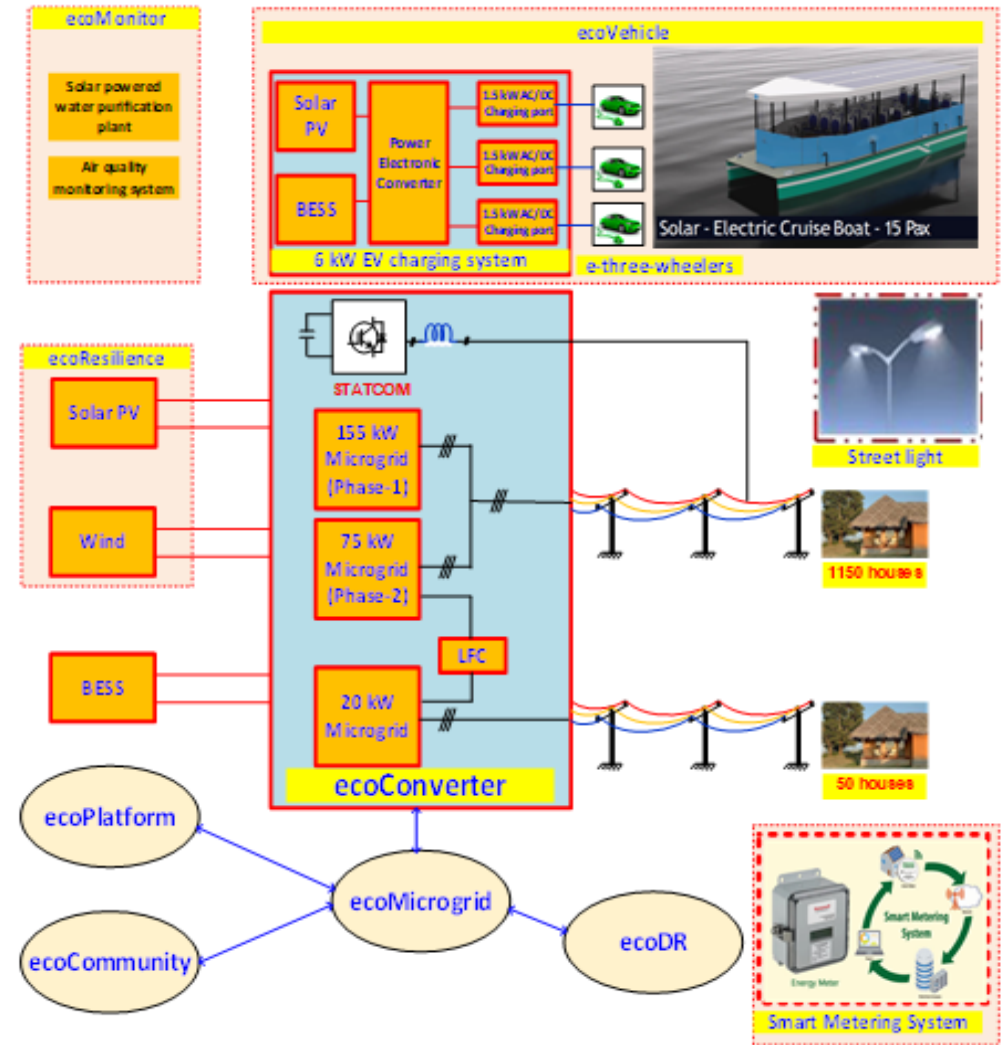


Ghoramara island (India)



RE-EMPOWERED
Renewable Energy EMPOWERing
European & Indian Communities

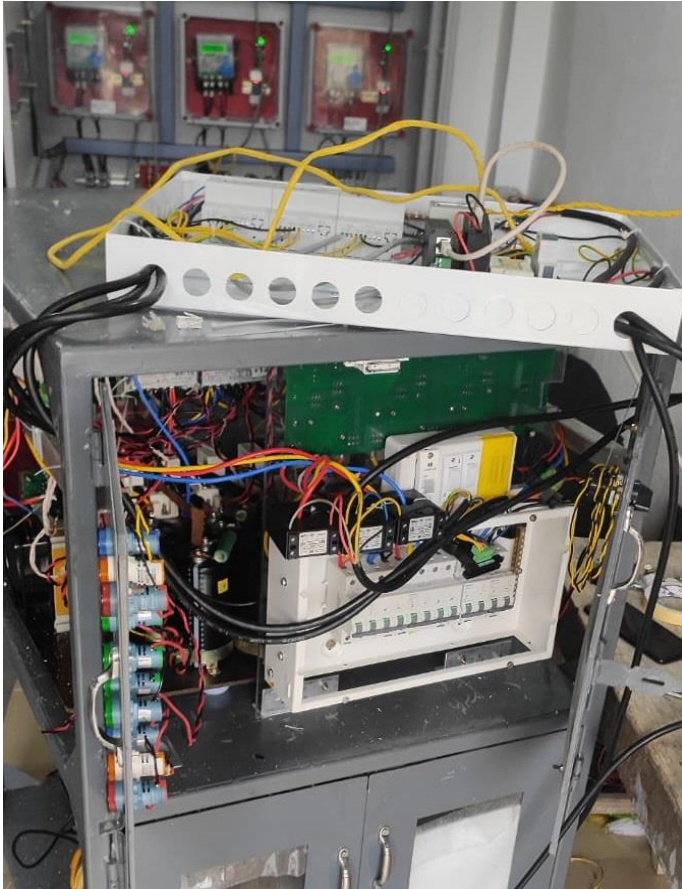
- Island **without** electricity access: residents live in very poor conditions, severe cyclonic storms every 5-10 years
- Microgrid was built and provides electricity to **650 houses** involving **2.500 citizens**, along with local market, police station and health center
- 160kW power plant (150 kW PV + 10 kW Wind Turbine)
- 10 kW microgrid with in-house developed power electronics
- Charging station with local PV and BESS for electric three wheelers
- Dimmable street lights
- Cyclone resilient structure for PVs and Wind Turbine



Ghoramara island (India)



RE-EMPOWERED
Renewable Energy EMPOWERing
European & Indian Communities



Imperial College
London



National Technical
University of Athens



DTU



Deloitte



ΔΑΦΝΗ
Δίκτυο Αερίφων Νέων



CSIR-CMERI, Durgapur



सौर विद्युत संस्थान



सौर विद्युत संस्थान



सौर विद्युत संस्थान

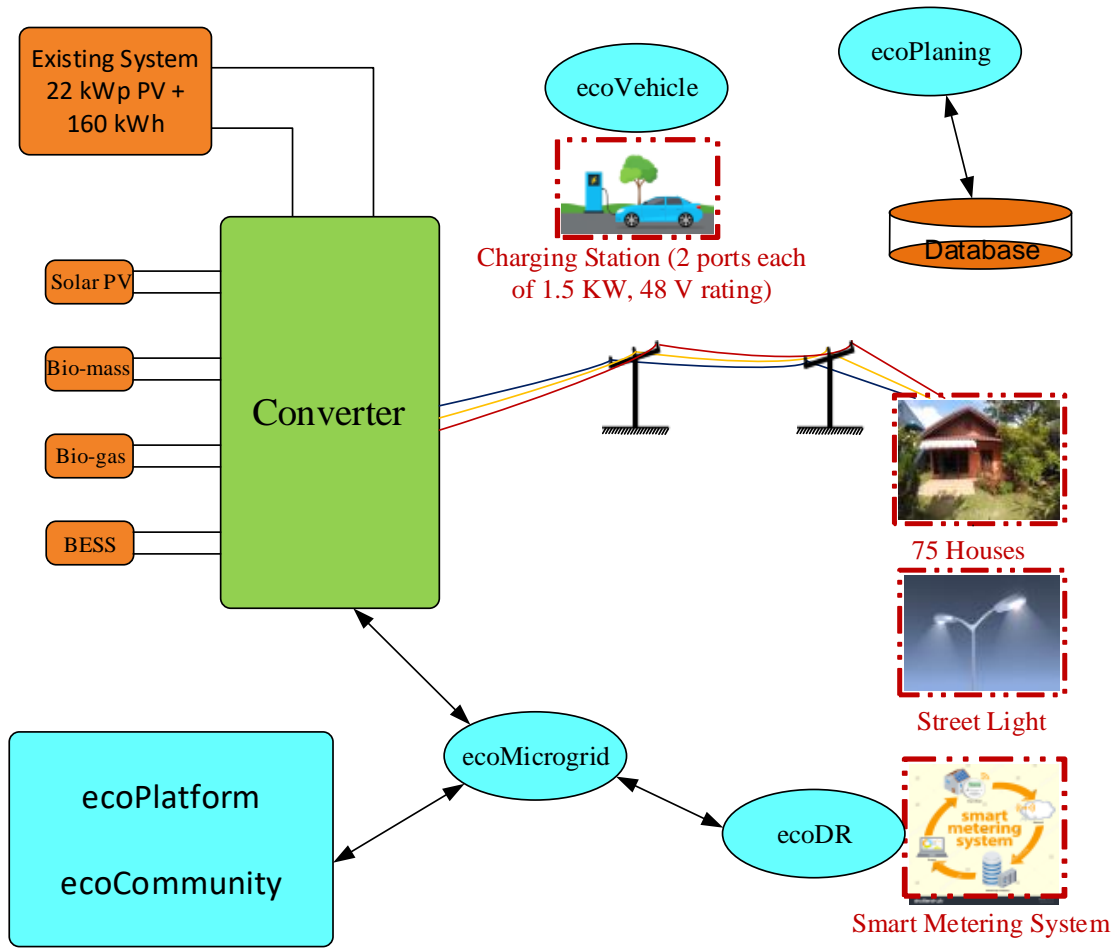


सौर विद्युत संस्थान

Keonjhar (India)



RE-EMPOWERED
Renewable Energy EMPOWERing
European & Indian Communities



50 KW Commercially available hybrid system
(30 kWp PV + 10 kWp Bio-mass + 10 kWp Bio-gas
+ 180 KWh BESS)

Sl. No.	Proposed hardware facilities	Capacity of the proposed hardware facilities
1.	A 50 kW microgrid system	30 kWp PV + 10 kW Biomass+ 10 kW Biogas
2.	Electrical Vehicles	2 Nos
3.	Smart Meters, with Fuse and MCCB/MCB	10 nos
4.	Solar Dimmable Lights	10 nos
5.	Charging Facility, 2 Ports	1.5 kw, 48V
6.	IoT based remote measuring system	1 nos



Summary of achievements



RE-EMPOWERED
Renewable Energy EMPOWERing
European & Indian Communities

■ *Social impact:*

- **650 houses** involving **2.500 citizens** obtained electricity access along with local market, police station and health center (Ghoramara, India)
 - **75 houses** involving **350 citizens** have been provided 24x7 electricity access rather than a 4-hour access they had previously. Starting of **new businesses**: small cloth shop and grocery shop (Keonjhar, India)
 - Formation of **cooperative society** to operate and maintain the microgrid of Keonjhar
-
- **10 innovative tools** have been developed and demonstrated in diverse demo-sites
 - *ecoMicrogrid tool (ICCS-NTUA and PROTASIS) is being **commercialized**.*
 - Presentation in **more than 70 events**. **8 scientific journal** publications. **13 scientific conference** publications. **Best Conference Papers Award** at the IEEE PES General Meeting
 - **8 EU-India research visits** (knowledge exchange) have been executed

