Workshop:

EU Geographical Islands as Leaders of Green Energy Tra

Project:

IANOS

SUSTAINABLE SOLUTIONS

for islands' decarbonisation

SUSTAINABLE PLACES 2023

PROJECT

OVERVIEW

Integrated Solutions for the Decarbonisation and Smartification of Islands

Starting date: 1/10/2020

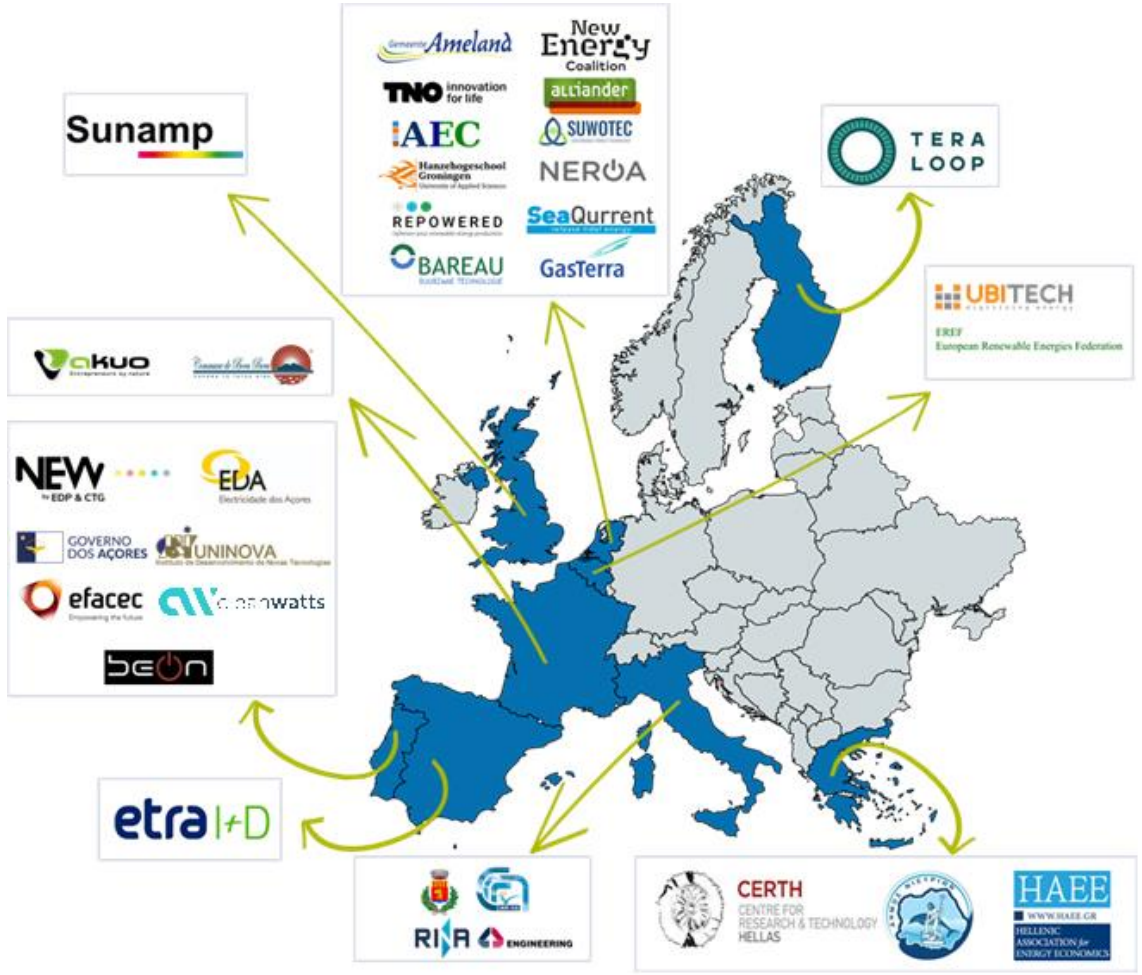
Duration: 48 months

Topic: LC-SC3-ES4 – Decarbonising energy systems of geographical islands

34 partners from 9 European countries

2 Lighthouse Islands, Ameland (NL) and Terceira (PT)

3 Fellow Islands, Lampedusa (IT), Bora-Bora (FR) and Nisyros (EL)



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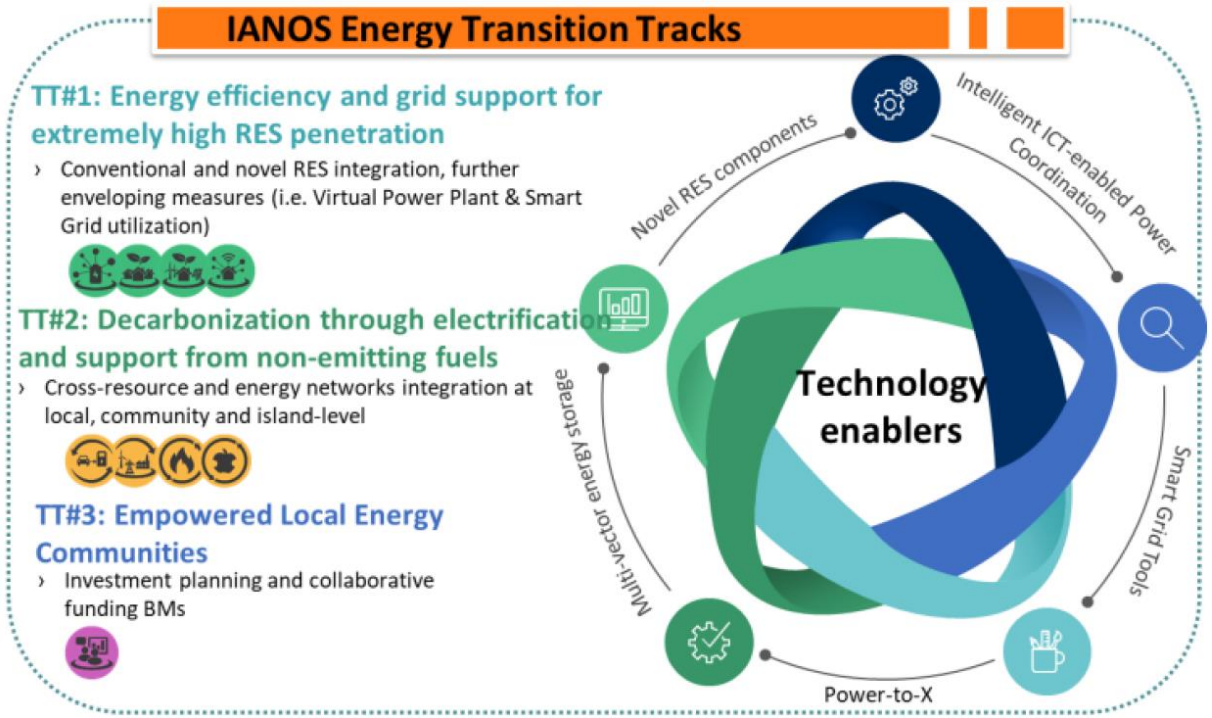
CONCEPT



Energy Transition Tracks and Use Cases

- Energy efficiency and grid support for extremely high RES penetratic
  I. Community demand-side driven self-consumption maximisa
  II. Community supply-side optimal dispatch and intra-day servi
  III. Island-wide, any-scale storage use for fast response ancillary s
  IV. Demand side management to support power quality and congestion management services

- Decarbonisation through electrification and support from non-emitting fuels
  I. Decarbonisation of transports – the role of e-mobility
  II. Decarbonising large industrial continuous loads through electrification and locally induced generation
  III. Circular economy – use of waste streams and gas grid decarbonisation
  IV. Decarbonisation of heating networks

- Empowered local energy communities
  I. Active citizen and LEC engagement into decarbonisation transition

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OBJECTIVES

- To facilitate seamless adoption of extremely high RES penetration, by encompassing synergetic operation of energy resources and carriers through a VPP framework, for pro re-active orchestration of energy flows
- To demonstrate specific technology-driven interventions envisioned through 3 TTs and 9 UCs, towards energy system decarbonisation in the project LH Islands
- To successfully guide EU Islands decision makers in the design of cost-effective and feasible action plans for decarbonising their energy systems
- To fully engage EU islanders in the transition towards a low carbon economy, considering them as an active player in the energy system
- To ensure high replication potential for IANOS results, while reaching on a critical mass of EU Islands and renewable energy stakeholders

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IMPACTS

1. Reduce significantly fossil fuel consumption, by developing RE-based systems (including heating, cooling and storage) that allow the island to go towards full decarbonising goals in a shorter time frame

2. Large-scale uptake of validated solutions on the same geographical island and/or on other geographical islands with similar problems
   i. Expected replicability potential: **4/5 (high)**, by reducing end-users energy bills in **15%** and achieving a pay-back of **<9 y**

3. Facilitate the creation and/or increase the number of renewable energy communities

4. Enhance stability of power networks for islands that are grid connected with the mainland
   i. Expected increase in systems' stability: **6 – 12%**
   ii. Expected increase in systems' demand side flexibility: **>9%**
   iii. Expected reduction in RE curtailment: **2%**
   iv. Expected achievable SAIFI and SAIDI: **<1.5 interruptions/y** and **<2.5h/y**

PROJECT

LHI#1 AMELAND – WEST FRISIAN – NETHERLANDS

- Location: West Frisian Islands, Wadden Sea, Netherlands
- Population: 3k
- Area: 58 km^2
- Electrical Power and Energy Systems: Island systems connected to mainland electricity and gas grids
- Legacy energy assets: Solar farm, BESS, distributed generation (PV)
- Load characteristics:
  - Energy consumption fluctuates significantly throughout the year and its very seasonal, due to tourism
  - Power exchange with the mainland has a peak of 6 MW (mainland → island) and 2,5 MW (island → mainland)

RES use increase **from 5.7 GWh/y up to 20.1 GWh/y**
12% of the total energy mix

Fossil fuel consumption reduction: **23%**
Down to 80.9 GWh/y

GHG emissions reduction: **39%**
Down to 58 152 tCO2eq/y

LEC membership/participation increase: **+300 prosumers/other actors involved**

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PROJECT

LHI#2 TERCEIRA – AÇORES – PORTUGAL

- Location: Azores Archipelago, North Atlantic Ocean, Portugal
- Population: 55k
- Area: 402 km^2
- Electrical Power and Energy System: Island isolated system
- Legacy energy assets: Geothermal power plant, wind farm, BESS
- Load characteristics:
  - Average yearly energy consumption: 170 GWh
  - Peak demand: >30 MW
  - Energy mix dependent on fossil fuels (62%) – other sources: RES (18%), geothermal (13%), waste (7%)

RES use increase **from 63.8 GWh/y up to 133 GWh/y**
70% of the total energy mix

Fossil fuel consumption reduction: **55%**
Down to 57 GWh/y

GHG emissions reduction: **55%**
Down to 41 325 tCO2eq/y

LEC membership/participation increase: **+40 prosumers/other actors involved**

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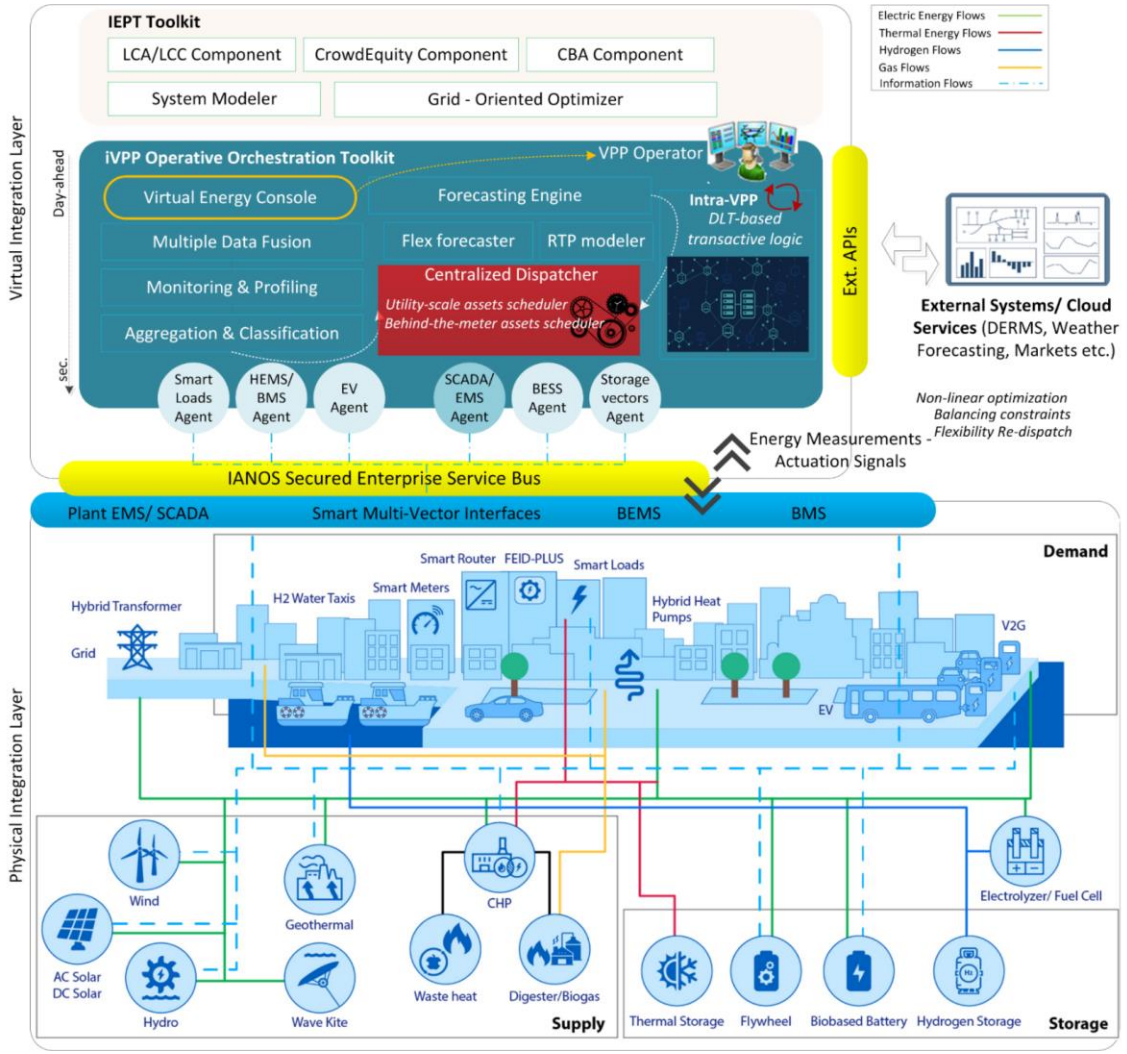
IMPLEMENTATION

INNOVATIVE TECHNOLOGIES



Software-based solutions, some highlights

iVPP architecture

- Physical and virtual integration layers, featuring a wide variety of assets
- Extensive communication interfaces
- Operative orchestration toolkit

Hardware-based solutions, some highlights

Hybrid transformer (independent phase control / power electronic-based reactive power compensation, delivering a stepless voltage regulation)

Tidal kite (underwater kite covering a large harvesting area perpendicular to the tidal flows)

Flywheel (hub-less rotor solution / magnetic bearings in vacuum)

Biobased saline battery (completely recycle without lithium or cobalt)

PCM heat battery (immersed heat exchanger into a phase change material)

IMPLEMENTATION

THE ISLANDS – WHAT WILL HAPPEN AND WHERE

iVPP
Solar Farm (6MWp)
Tidal Kite (500kWe)
Biobased Saline Battery (120kWh)
Micro-CHP Systems (5,5kWth)
CH4 Fuel Cells
Hybrid Heat Pumps
Residential PV systems
EV Charging Stations

UCs: 1, 2, 3, 4, 5, 6, 7, 8 and 9

iVPP
Hybrid Transformer (400kVA)
Flywheel (100kW)
V2G EV Chargers (10kVA)
Smart Energy Routers (5kW)
Electric Water Heaters
Residential Electrochemical and Heat Batteries
Residential PV Systems and Gateways

UCs: 1, 2, 3, 4, 5 and 9

Lampedusa will study the feasibility of some of IANOS UCs

Targeting a **63% cut of CO2 emissions until 2023**

Highly-replicable UCs: 3, 5, 7, 8 and 9

Bora-Bora is willing to assess the replicability potential of deferent solutions tested in IANOS

Envisioning to **produce 75% of the island's total energy needs from RES by 2030**

Highly-replicable UCs: 2, 3, 5, 7, 8 and 9

Nisyros will follow-up on IANOS outcomes and evaluate potential scaleup

Aiming to achieve a total of **>800 tCO2eq savings per year**

Highly-replicable UCs: 1, 4, 5, 6, 7, 8 and 9

HIGHLIGHTS

- IANOS is an EU-funded project aiming to design and test highly replicable advancements in smart energy systems' orchestrated operation
- The project deploys both, conventional and innovative technologies, fully integrated with an iVPP for optimal resources and system's management
- The 9 UCs will be demonstrated in 2 Lighthouse Islands (Ameland and Terceira), and later replicated in the 3 Fellow Islands (Lampedusa, Bora-Bora and Nisyros)
- Expected outcomes and foreseen impacts are considered significantly relevant for EU islands energy transiti

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Check out our latest news and releases at IANOS.EU

And follow us on social media, IANOS H2020 Project

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