Robinson

Smart integ**R**ation **O**f local energy sources and innovative storage for flexi**B**le, secure and cost effic**I**ent e**N**ergy **S**upply **ON** industrialized islands

Name and Last Name :
Date :
Organisation :

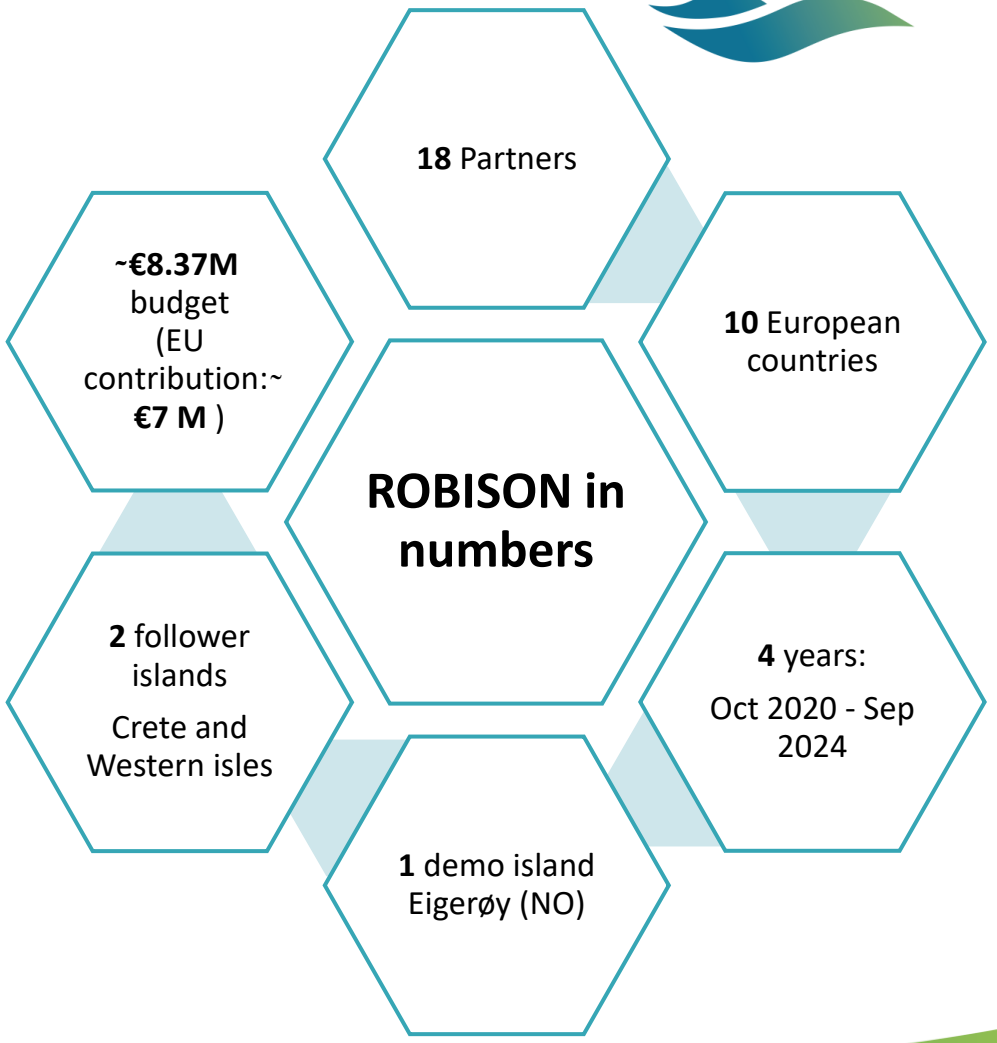
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957752

ROBINSON in a nutshell

ROBINSON aims to help **decarbonize (industrial) islands** by developing an intelligent, robust and flexible energy management system that **integrates technologies across different energy vectors (electricity, heat and gas**).

The ROBINSON system will be **demonstrated on the island of Eigerøy, Norway**.

Virtual demonstrations will be conducted for **Crete (Greece) and the Western Isles (Scotland)**.



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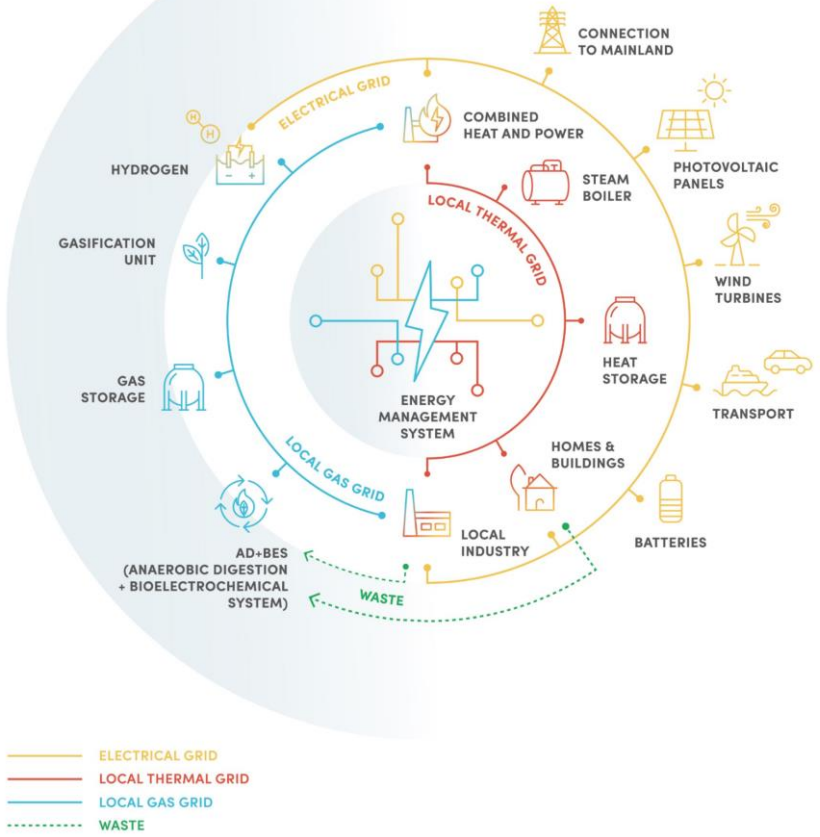
Main Goal

- Development of an **integrated energy system tailored to islands** with industrial activities. A **flexible and modulable system** that can answer to the different needs of the environment.
- **Couple** locally available **energy sources**, electrical and thermal networks and innovative storage technologies, thus increasing energy efficiency and security of supply.
- **Technological innovation:** development and demonstration of several new technologies that will unlock new energy sources and a new energy integration system.
- **Cover the energy demand** while **reducing the use of fossil fuels** and the islands' emissions.



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Project Timeline

1 Oct 2020

Start of the project

EMS development and adaptation

1 Oct 2021

1 Oct 2022

Validation of the EMS for all involved islands

Demonstration in operational environment: **Eigerøy Island**

1 Oct 2023

30 September 2024

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Project Objectives

Technological

Optimise, validate and integrate innovative technologies

Develop and validate a modular and flexible Energy Management System (EMS)

Demonstration

Demonstrate the large-scale applicability of the ROBINSON system

Replication

Replication of the modular EMS and the concepts

Wide dissemination

Impacts

Human health and the environment

System cost-competitiveness

Business model

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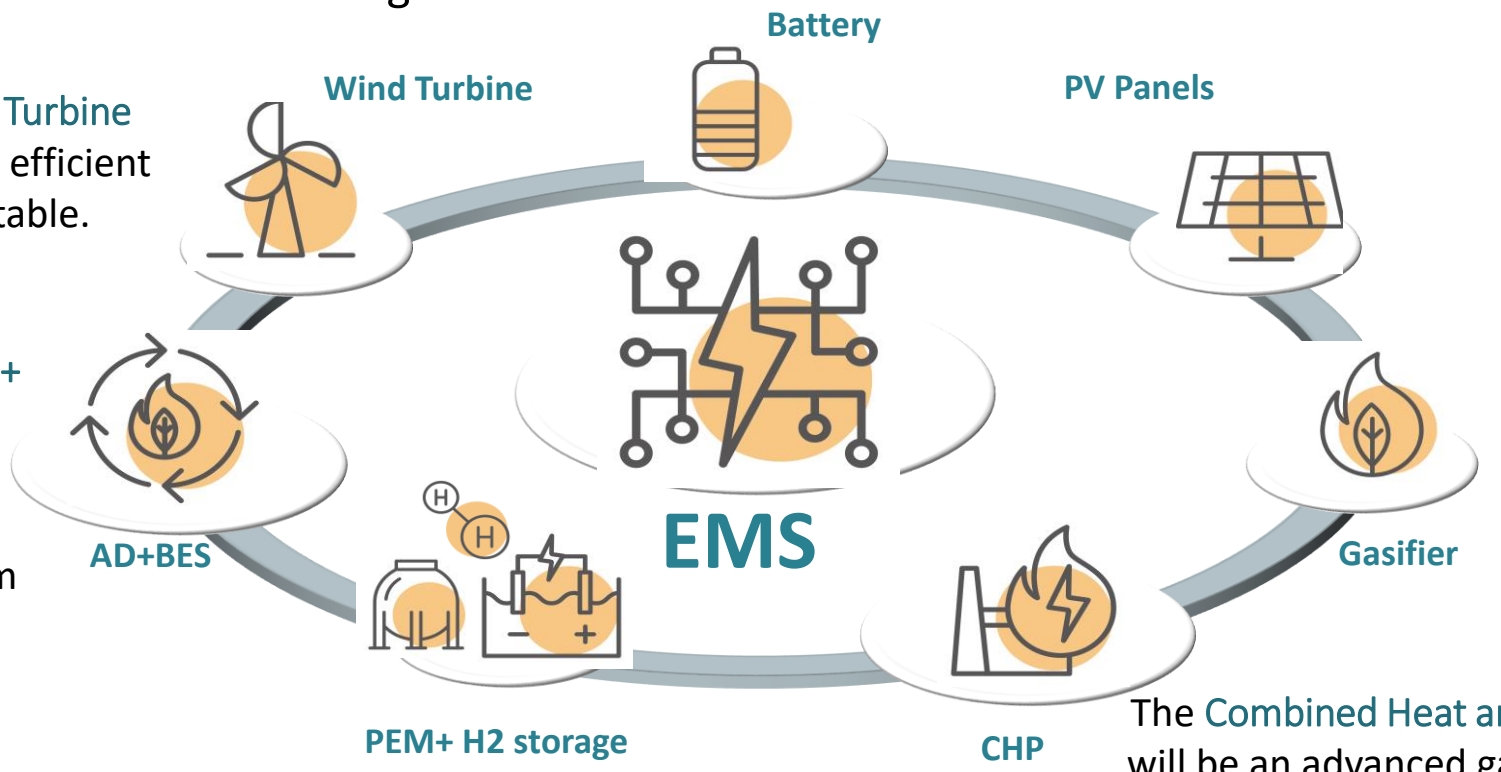
Technological development

The key element of the ROBINSON project is the development, adaptation and demonstration of different technologies.

The innovative Wind Turbine will be low cost, more efficient and socially acceptable.

The Anaerobic Digestion + Bio Electrochemical System will allow to efficiently treat the process wastewater from Eigerøy island fish industry and convert its organic matter into biomethane.



The Energy Management System will integrate the existing system with new installed distributed technologies and end-users across different energy vectors (electricity, heat and gas)

The Combined Heat and Power system will be an advanced gas turbine with a combustion kit upgraded to burn hydrogen and syngas.

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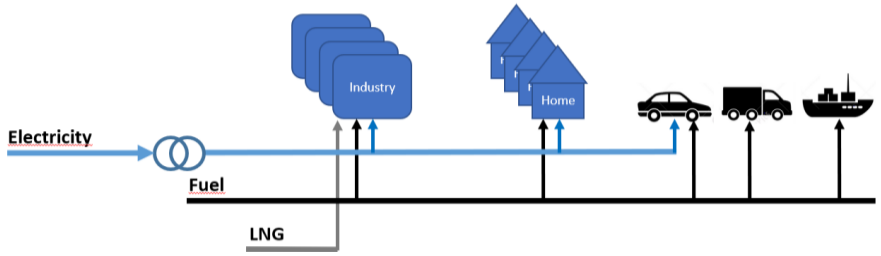
The demo island

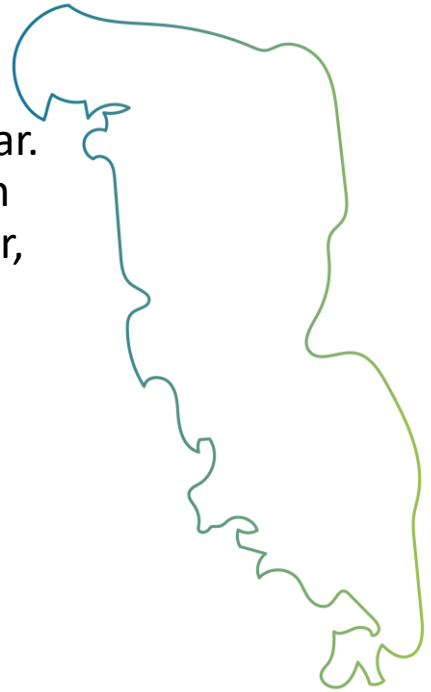
ROBINSON's demo case will be developed on the island of Eigerøy, in Norway.

Eigerøy's current energy profile

Electricity: ~100% is imported from the mainland with minor share of wind and solar. (Eigerøy is connected to the mainland by an undersea cable: average load 7,9MWh/hour, peak demand 18,5MWh/hour)

Thermal: 6950 MWh liquid fuel; ~ 26500 MWh/year LNG





Basic facts	
Size	20 km^2
Population	~2500 (about 800 households)
Climate	Relatively high temperatures in winter and low in summer; relatively high wind speed
Industrial profile	A new fish industry has been implanted in January 2019, increasing the island's need for electricity and steam. Moreover, new industries are to be established in the next years; they will increase the island's energy demand and require an upgrade of the existing energy system.

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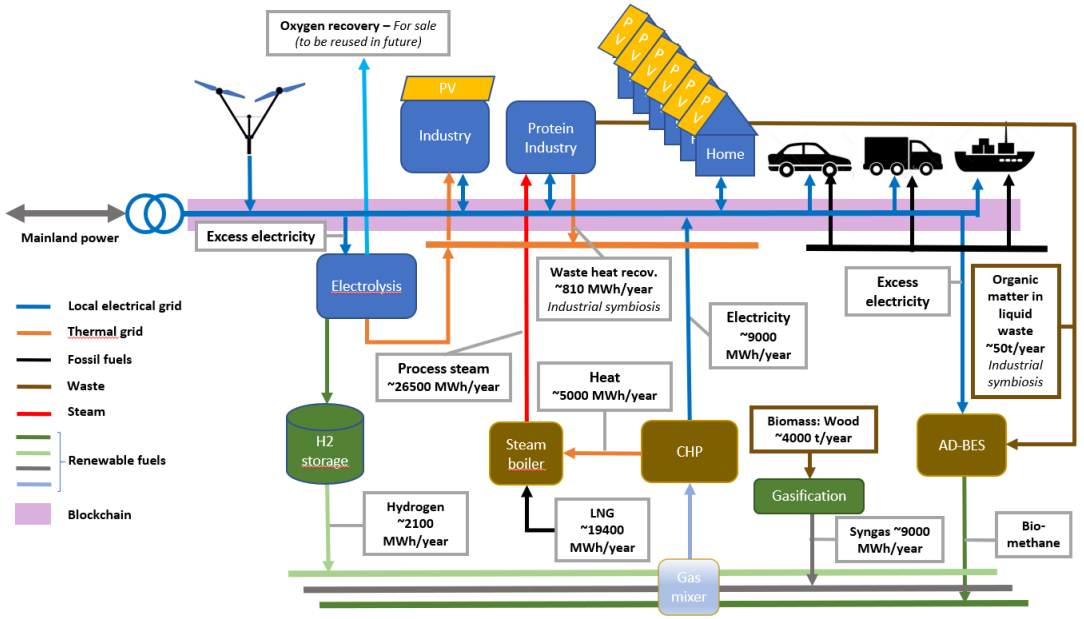
The demo island

The pilot plant will be installed at the premises of the ROBINSON partner Prima Protein (PRIMA), which is the island's main consumer of fossil fuel (in 2019 consumption equivalent to 30GWh: ~80% of fossil fuel consumption in Eigerøy).

On Eigerøy, **the pilot system**, managed by the validated EMS, **will reach TRL 7**.



Thanks to ROBINSON, Eigerøy will move from being fully dependent on mainland and fossil fuel to an integrated, independent and low-carbon energy system!

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Follower islands

Crete - Greece

Basic facts

Electricity generation	≈3TWh in 2018 (≈80% -> 3 fossil fuel power plants);
RES penetration	17% Wind; 4,6% Solar; 0,01% Hydro; Bio not used
Interconnection	280MW by 2020; 1000MW by 2022
Industrial profile	2 industrial parks planned
Seasonality	Intense energy consumption due to tourism

ROBINSON'S CONTRIBUTION:

- Waste valorisation
- Energy storage
- Increase share of RES

Western Isles - UK

Basic facts

Electricity generation	778GWh in 2013
RES penetration	74GWh
Interconnection	AC subsea cable limited to 22MW
Industrial profile	Major industrial energy users on Isle of Lewis
Seasonality	5GWh back up power concentrated in July and Nov-Feb

ROBINSON'S CONTRIBUTION:

- Possible replicability of integration of onshore wind, storage and hydrogen production;
- Reduction of fuel poverty

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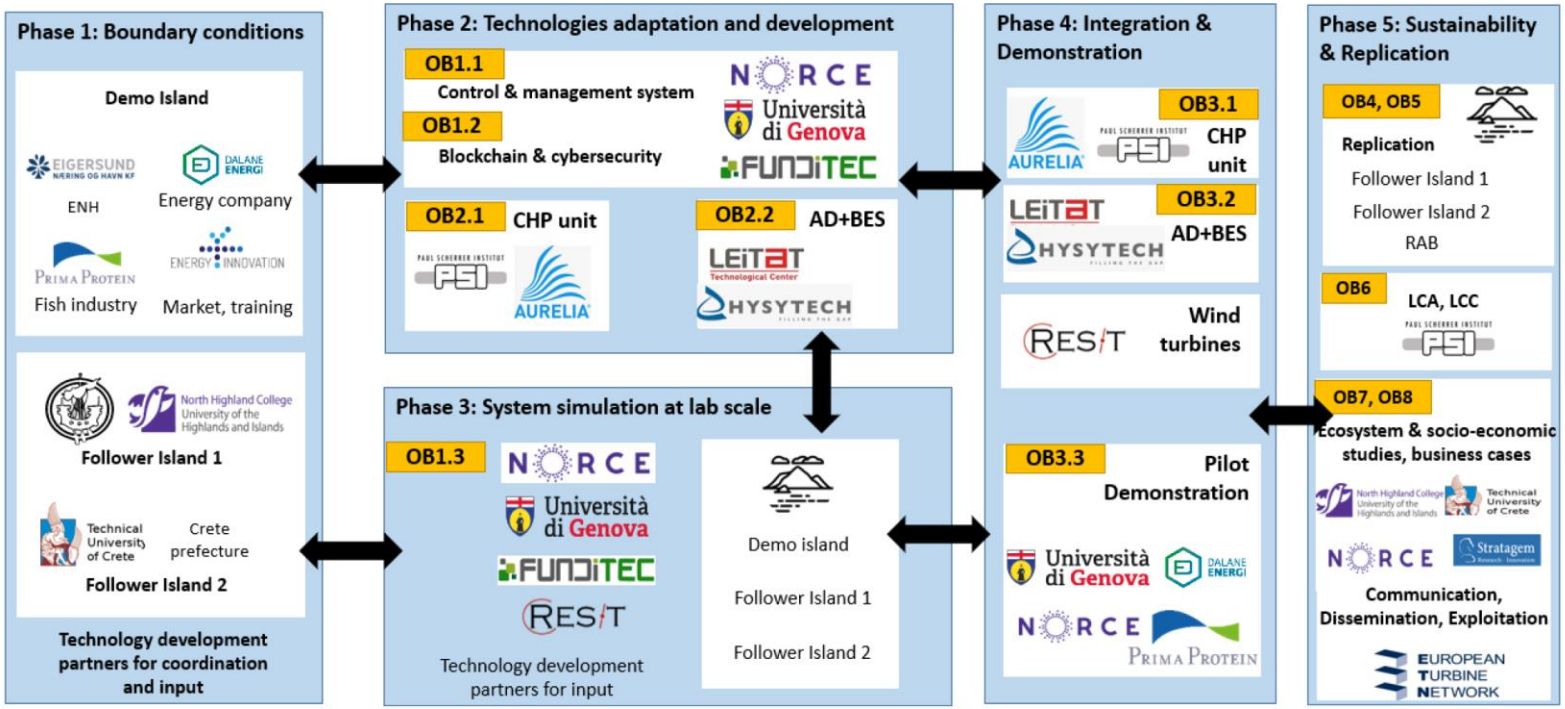
Project Methodology

ROBINSON will last 48 months, from October 2020 till September 2024. To achieve its objectives, ROBINSON has been divided into 8 interrelated Work Packages. Each phase is strictly correlated to the objectives.



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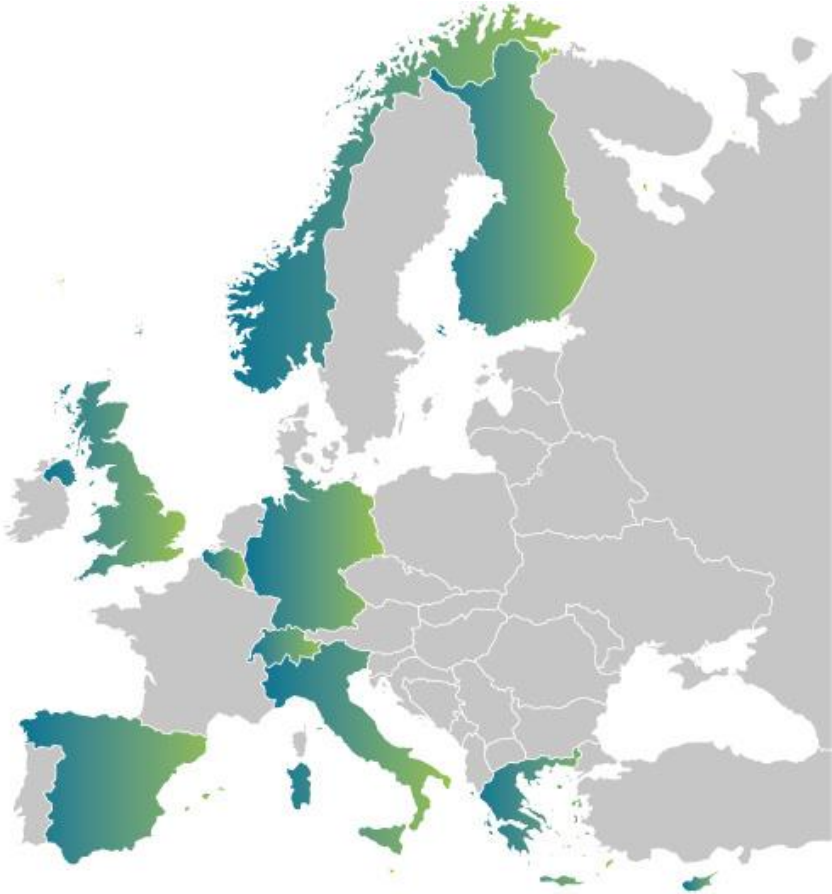
Consortium

ROBINSON brought together a consortium composed of stakeholders with complimentary expertise from 10 European countries:

- Public sector: 3 municipalities representing 3 islands
- Companies: 4 Small and medium enterprises, 3 Large enterprises
- Academia: 4 Research and Technology organisations, 3 Universities
- Other: 1 association



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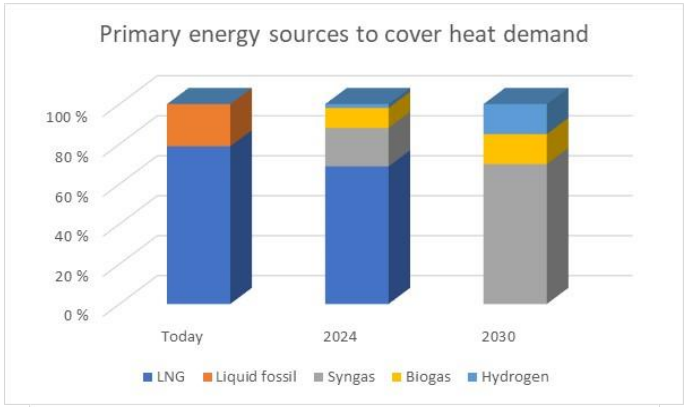
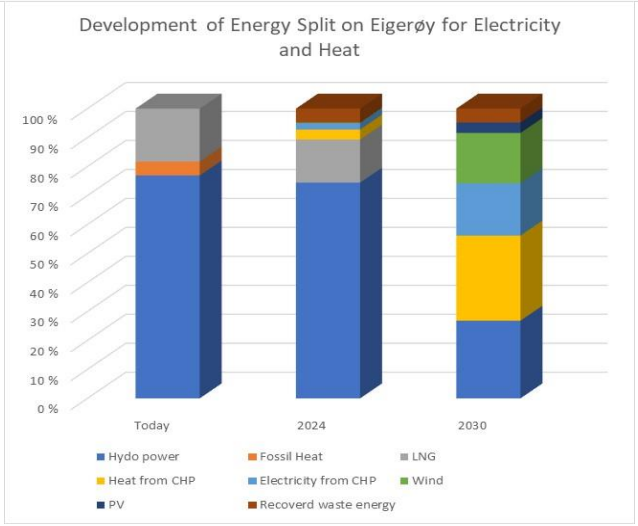
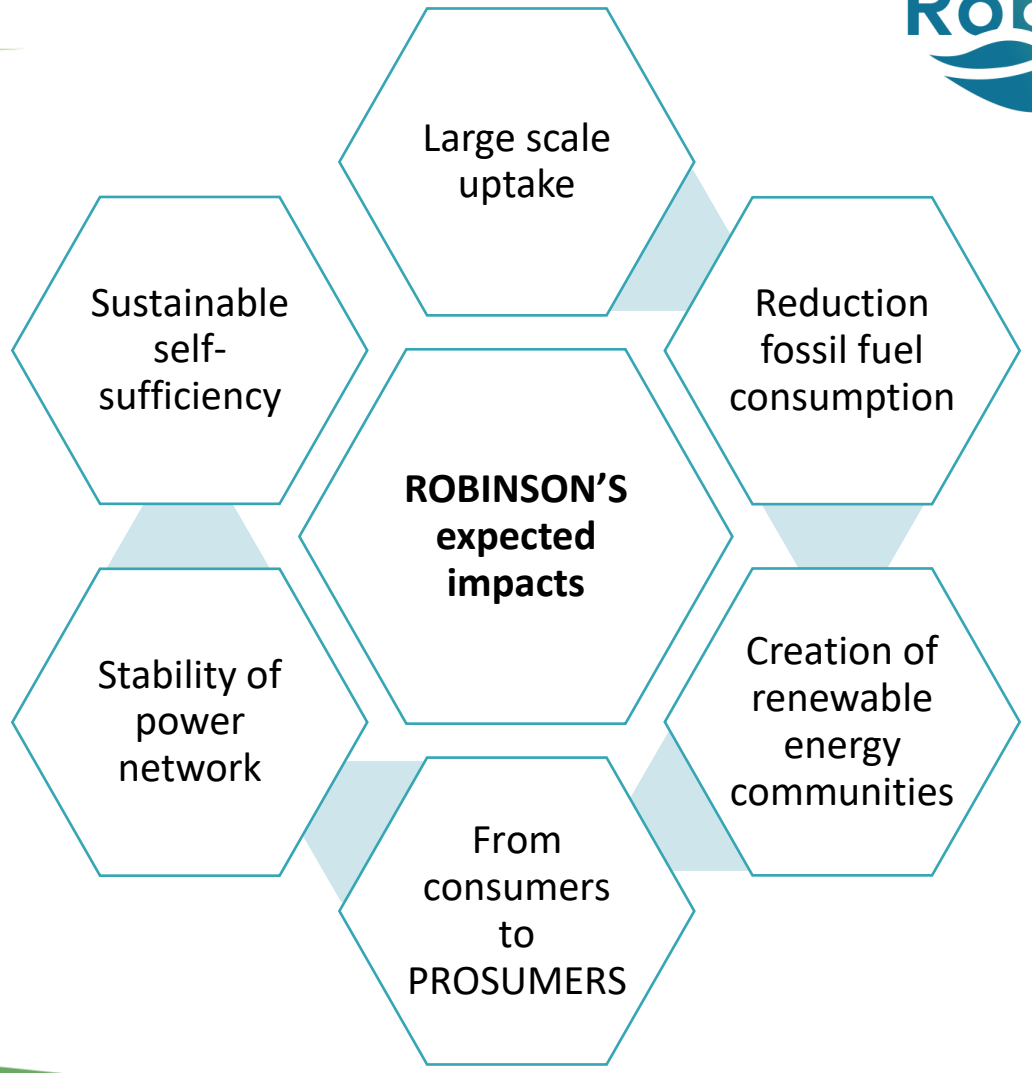
Expected impacts







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Environmental impacts (at 100% coverage)

Losses reduction via integrated management of various DER technologies

Increased **clean fuel flexibility** for CHP

Waste valorisation

Up to 90% cut of CO2 emissions (100% for industry and 50% for transport)

Connecting ships to local electricity grid during usage of the harbour

Reduction discharge into local costal water

Local use of wood **biomass** instead of export

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Economic impacts

On Eigerøy: avoid expensive extension of transmission grid (6.1 – 12.2 M €)

System cost-competitive in comparison to alternatives (e.g. batteries)

Avoided CO2 taxes: potential saving 400k€/year

Costs savings and economic benefits

Reutilization of by-products such as oxygen

Implementation industrial symbiosis concept

Harvest otherwise wasted energy and supply

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Project structure

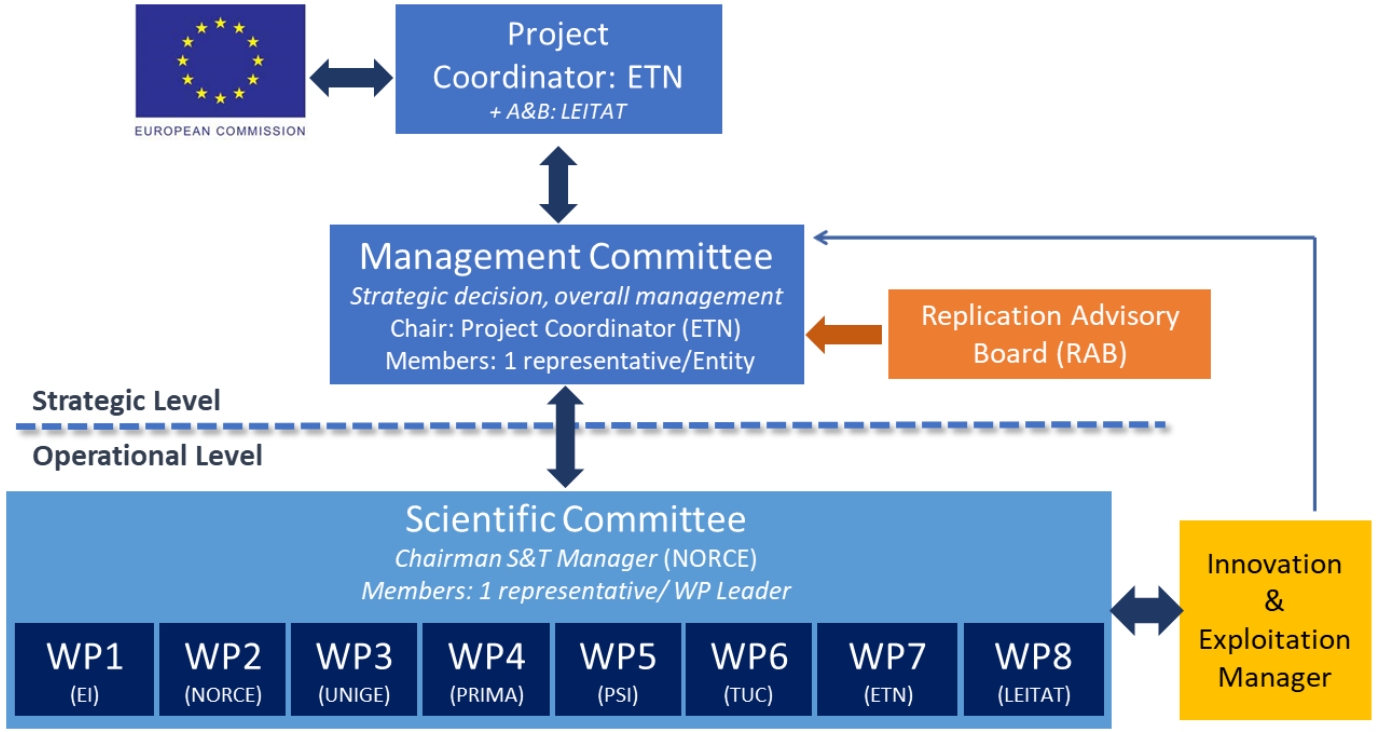
Two level of project management:

Operational Level

where tasks are performed

Strategic Level

where the main project decisions are taken



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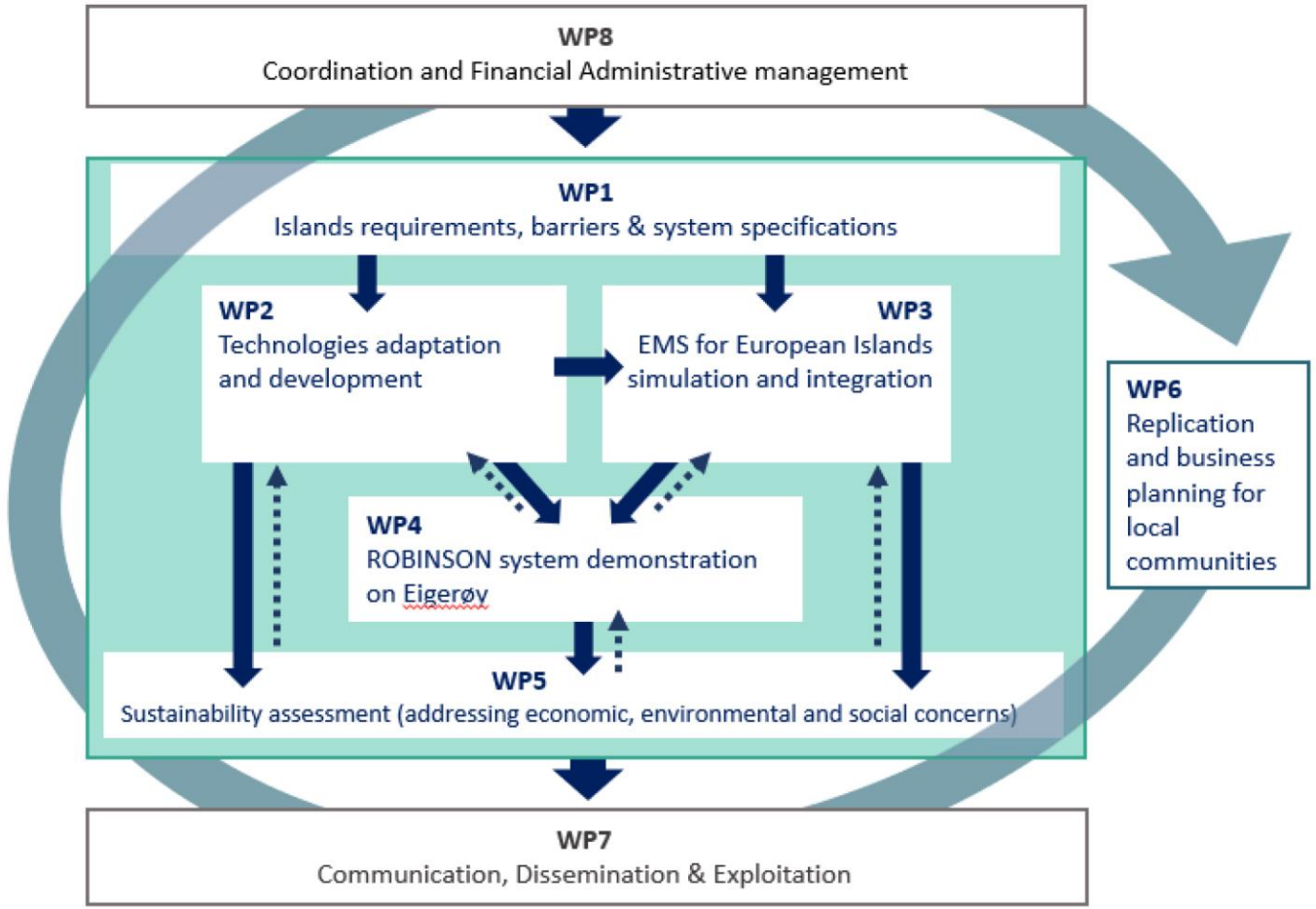
Work Packages



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Thank you!

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