

Tech Brief

A strategic and operational guide

REFORMERS project

Regional Ecosystems FOR Multiple-Energy
Resilient Systems



**Funded by
the European Union**

This project has received funding from the European Union's
research and innovation programme Horizon Europe under
the grant agreement No.101136211

Project funded by



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
State Secretariat for Education,
Research and Innovation SERI

Table of content

Executive summary	P. 2
The Vision	P. 3
Flagship Valley	P. 4
Technology stack	P. 4
Renewable Energy Valley tracks	P. 5-6
Digital twin	P. 6
Scaling the model in the Replication Valleys	P. 7-8
The REFORMERS Holistic Approach	P. 9
Future roadmap	P. 10

Executive summary



Europe's energy system faces critical challenges, with significant imports of oil and gas. The REFORMERS project develops and demonstrates the scalability of Renewable Energy Valleys as decentralized systems designed for **100% self-sufficiency through renewable sources and smart technologies**.

Funded by the European Union's Horizon Europe programme, REFORMERS aims to enhance renewable energy supplies through diversification and optimization of local energy systems, combining consolidated technological solutions with innovative energy management approaches.

This document outlines our tangible progress to encourage investment in similar initiatives across Europe.



The Vision

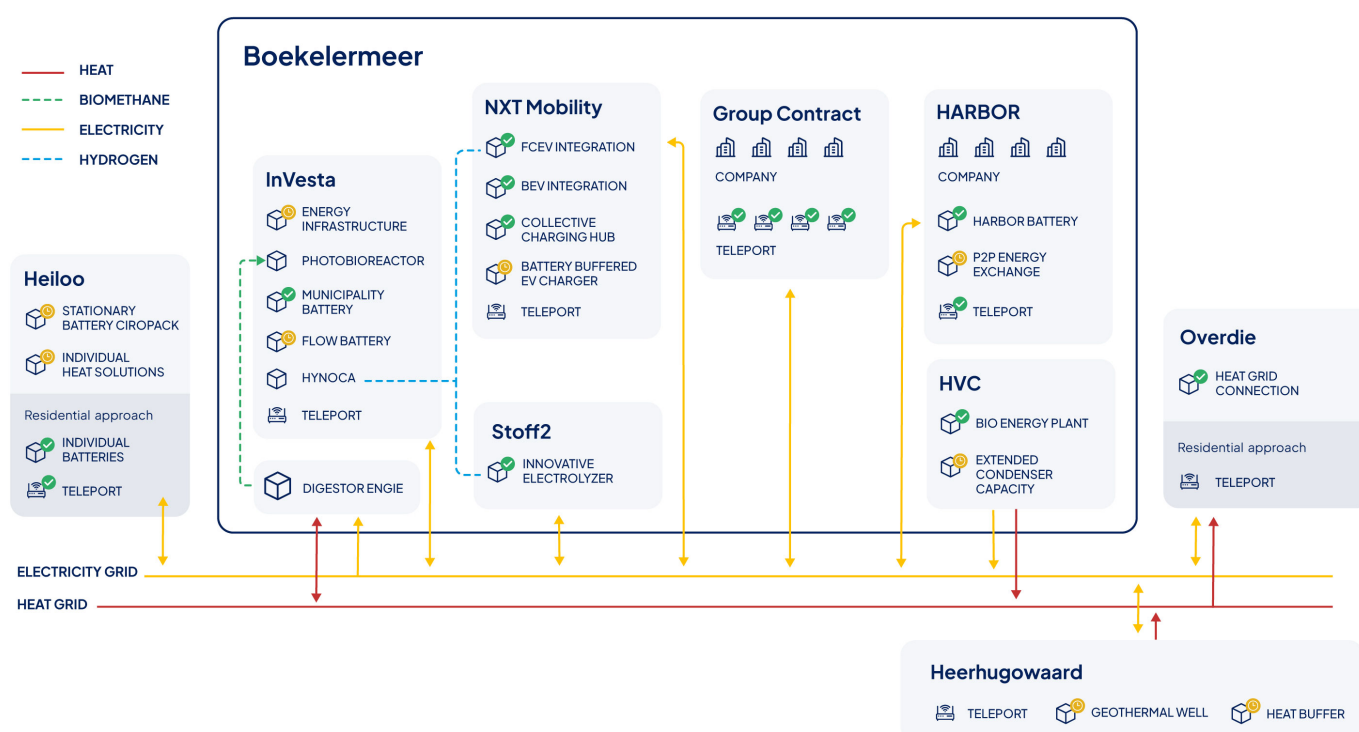


A Renewable Energy Valley (REV) is an **integrated local energy system** that bridges the gap between generation and consumption. Unlike traditional linear grids, REFORMERS breaks technical silos by coupling multiple carriers. This vision fosters local innovation,

community engagement, and long-term resilience. Our mission is to co-create these solutions with local decision-makers, ensuring that the REV model is not just a set of pilot studies, but a **scalable European standard for regional decarbonization**.



Flagship Valley current state of affairs



Flagship Valley



The REFORMERS Flagship Valley (FV) lies in the Municipality of Alkmaar and Heiloo in the Netherlands, serving as a real-world demonstration of a multi-actor, multi-carrier and multi-solution Local Energy System. It is a **4km² area** including housing, industrial, commercial, and agricultural activities and the primary objective is to prove the **feasibility, effectiveness and social acceptability of the REV concept**, establishing a replicable approach for deployment across Europe.

This “Multi-Actor” environment demonstrates how a **Local Energy System** can balance the needs of diverse stakeholders. The FV in Alkmaar is not a simulation: technologies in here are currently operational, providing real-time data on performance and grid stability under various load conditions.



1

Boekelermeer
Business and
agricultural area

2

Overdie
Residential zone

3

Heiloo
Residential and
Business Areas

Technology stack



REFORMERS deploys a suite of high-TL (Technology Readiness Level) solutions:

Generation and Conversion:

Implementation of HYNOCa thermolysis and STOFF2 hybrid electrolyzers for clean Hydrogen; high capacity geothermal wells (HVC) and advanced thermochemical conversion at the InVesta high-tech center.

Storage:

Multi-scale BESS (Battery Energy Storage Systems) including 5MWh harbor and 2MWh InVesta batteries. Thermal stability is ensured by a 1,600 m³ atmospheric heat buffer.

Carbon Circularity:

A Photobioreactor system captures CO₂ from digestors to cultivate algae (B-CCU), achieving negative emissions while producing valuable bio-commodities.

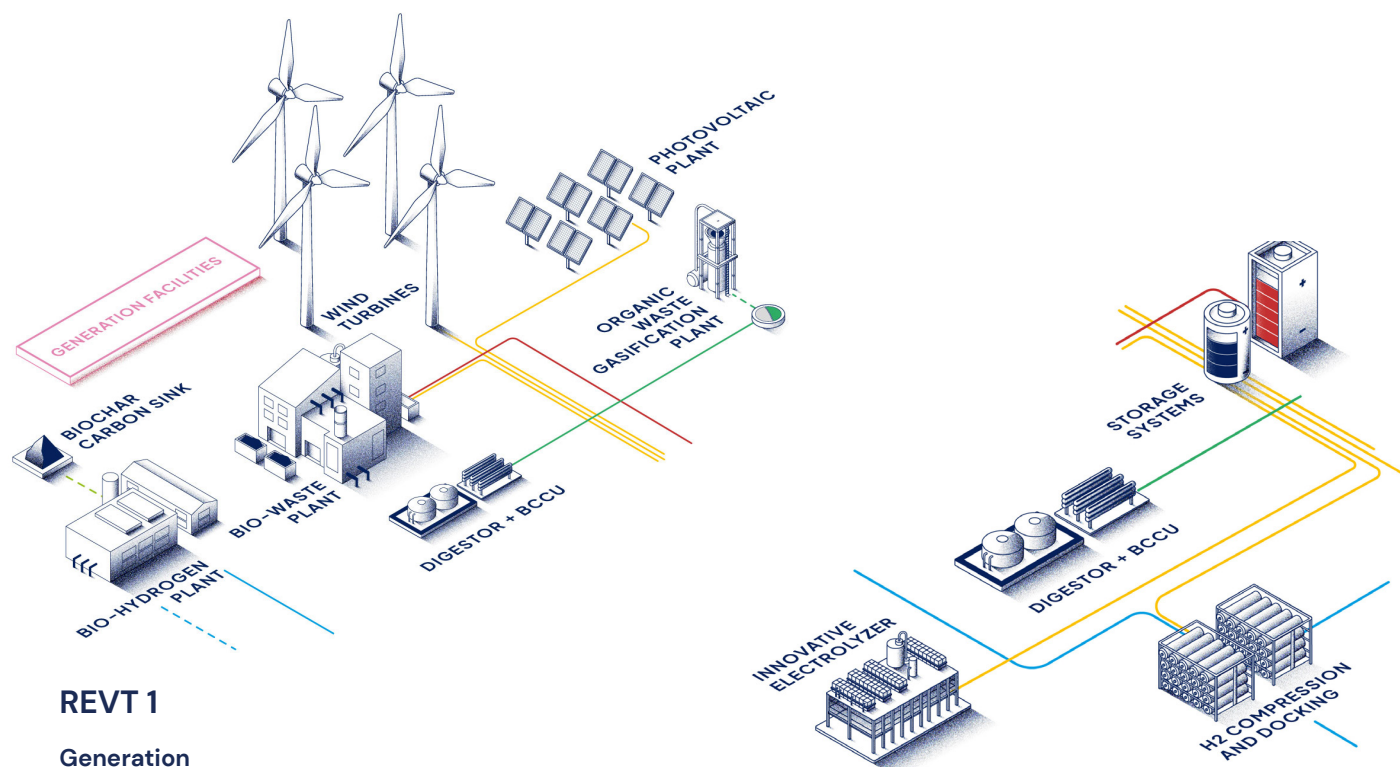
Smart Mobility:

Deployment of a battery and fuel cell electric vehicles, as well as a battery buffered EV charger and a public charging hub optimizing local grid capacity.

Renewable Energy Valley tracks



The project structures its innovation implementation through distinct Renewable Energy Valley Tracks (REVTs), which act as functional blocks to set up a valley.



REVT 1

Generation

Increases renewable energy generation (wind, solar, heat, hydrogen, and bio-methane)

REVT 2

Conversion, storage and distribution

Focuses on the transport, storage, and conversion of carriers throughout the area.

REVT 3

End users and prosumers

Covers all consumers – residential, industrial, and mobility – enabling them to act as prosumers.



REVT 4

Monitoring, control and optimization

Establishes the monitoring and control architecture to manage congestion and balance the system.

REVT 5

Financial, legal and social dimensions

Addresses the financial, legal, and social dimensions to ensure local ownership and governance



Digital Twin

The Digital Twin of the Flagship site is a cornerstone of REFORMERS' intelligent operational management, providing real-time insights and supporting smart decision-making. It integrates multiple energy models - hydrogen, electricity grids and renewable resources to assess and optimize energy use. By leveraging open data, the Digital Twin offers scenario analysis for "What If" situations, enabling development of targeted policies by the municipal policymakers.



Scaling the model in the Replication Valleys



The REFORMERS strategy is built on the immediate scalability of its results. While Alkmaar serves as the testbed, six Replication Valleys are actively adapting the model to prove its flexibility across different regulatory, climatic and socio-economic landscapes. These regions actively collaborate as co-creators, not merely observers, to shape their own decentralized energy future within this network.



Greater Poland Energy Valley

Konin, Poland

A region of **433,000 inhabitants** transitioning from lignite mining to a renewable system focused on green hydrogen generation.



Murau District

Austria

A rural alpine region with **30,000 inhabitants** aiming for total energy independence by 2040 through hydropower, wind, and solar thermal integration.



Western Macedonia

Kozani, Greece

Represented by the Municipality of Kozani (**270,000 inhabitants**), shifting from coal dependency to integrated renewable ecosystems.



DDS Region

Belgium

A district of **181,000 inhabitants** focusing on PV expansion and biogas/fermentation to replace fossil fuels in industrial contexts.



Delft Region

Netherlands

A scientific and industrial hub (**106,000 inhabitants**) integrating urban energy needs with greenhouse agricultural districts.



Tolosaldea

Spain

A region of **48,000 inhabitants** developing innovative governance and energy communities for all kind of citizens and SMEs.

The REFORMERS Holistic Approach

A Holistic Approach for the transition of Local Energy Systems to Renewable Energy Valleys



The REFORMERS Holistic Approach is designed to empower regions to develop their own REV through technical and non-technical dimensions. It includes:

1. Societal impact booster

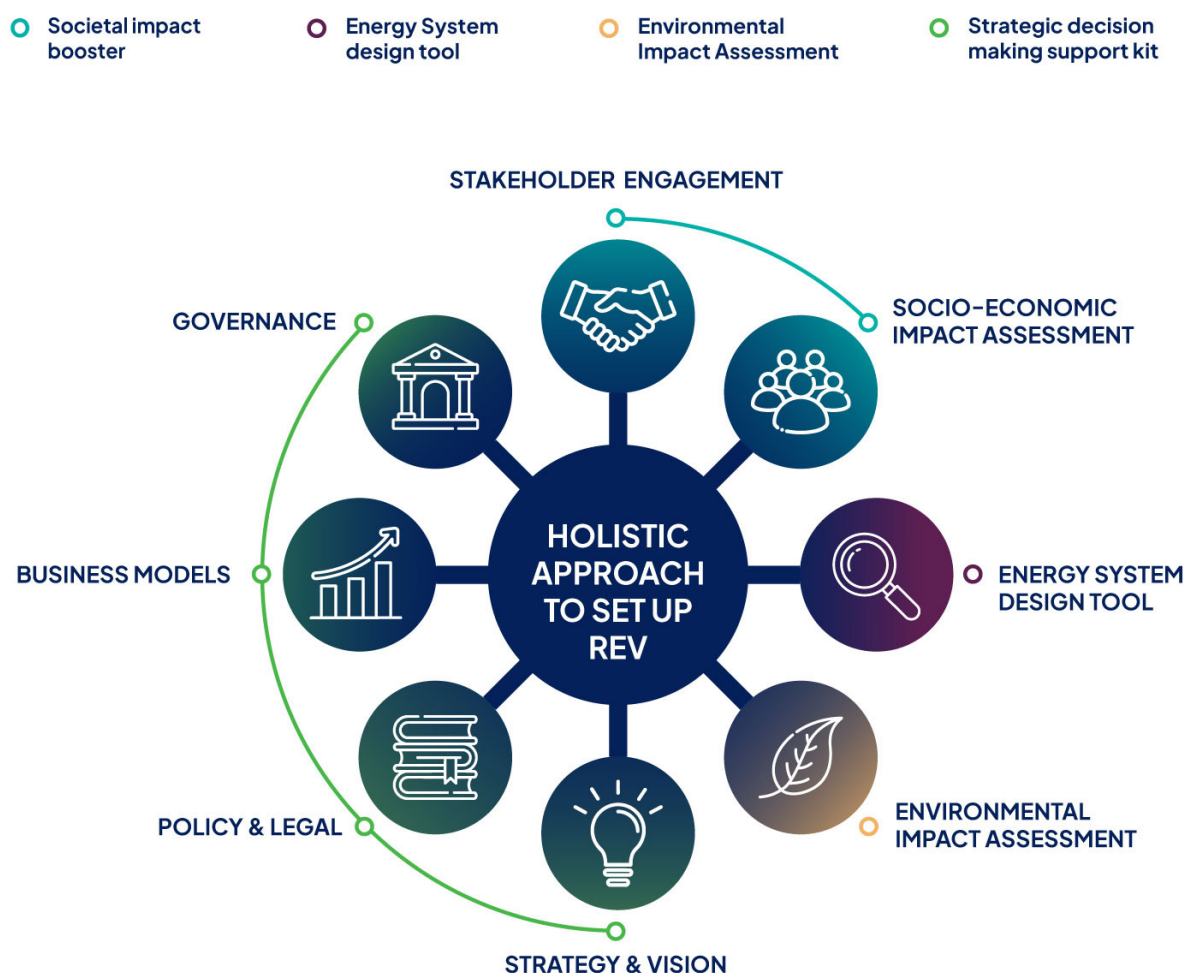
- Stakeholder Engagement methods and guidelines.
- Socio-economic Impact Assessment framework

2. Energy System design tool

- 3. **Environmental Impact Assessment:** enables dynamic life-cycle assessments (LCA and LCC)

4. Strategic decision making support kit

- Business models generator
- Governance structure modeler
- Policy and Legal Assessment tool

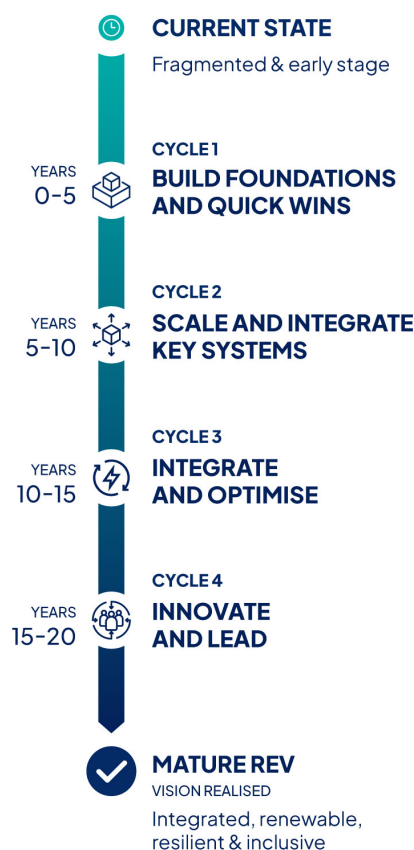


Future roadmap



REFORMERS has successfully validated the REV concept as a **scalable model for regional decarbonization**. By integrating advanced technology stacks, digital twins, and systemic planning, the project demonstrates how local ecosystems can lead Europe's clean energy transition.

With proven viability and measurable results in the Flagship Valley, we offer a **concrete pathway for regional transformation** aligned with EU Green Deal goals. Opportunities for investment and collaboration are now open as we expand this model across Europe.



Example of a Renewable Energy Valley development pathway

Flagship Valley Data

Performance Indicator	target end of project	Percentage variation compared to baseline scenario
Installed solar capacity	+13 MW	100%
Geothermal heat production	+380 GJth/y	N/A*
Clean hydrogen production	+260 ton/y	N/A*
Biomethane production	+50 GWh/y	N/A*
Installed storage capacity	Batteries: +13.5 MWh Hydrogen: +24 MWh Heat: +25 GJ	Batteries: 1100% Hydrogen: N/A* Heat: N/A*
Annual CO2 emissions	-15 kton/y	-75%

* N/A stands for "100% new installation, not present when project began"



REFORMERS
RENEWABLE ENERGY VALLEYS



Project Coordinator



Flagship Valley coordinator



Consortium



CONTACTS

info@reformers-energyvalleys.eu

www.reformers-energyvalleys.eu

Join us

