

REFORMERS

RENEWABLE ENERGY VALLEYS

Regional Ecosystems FOR Multiple-Energy Resilient Systems

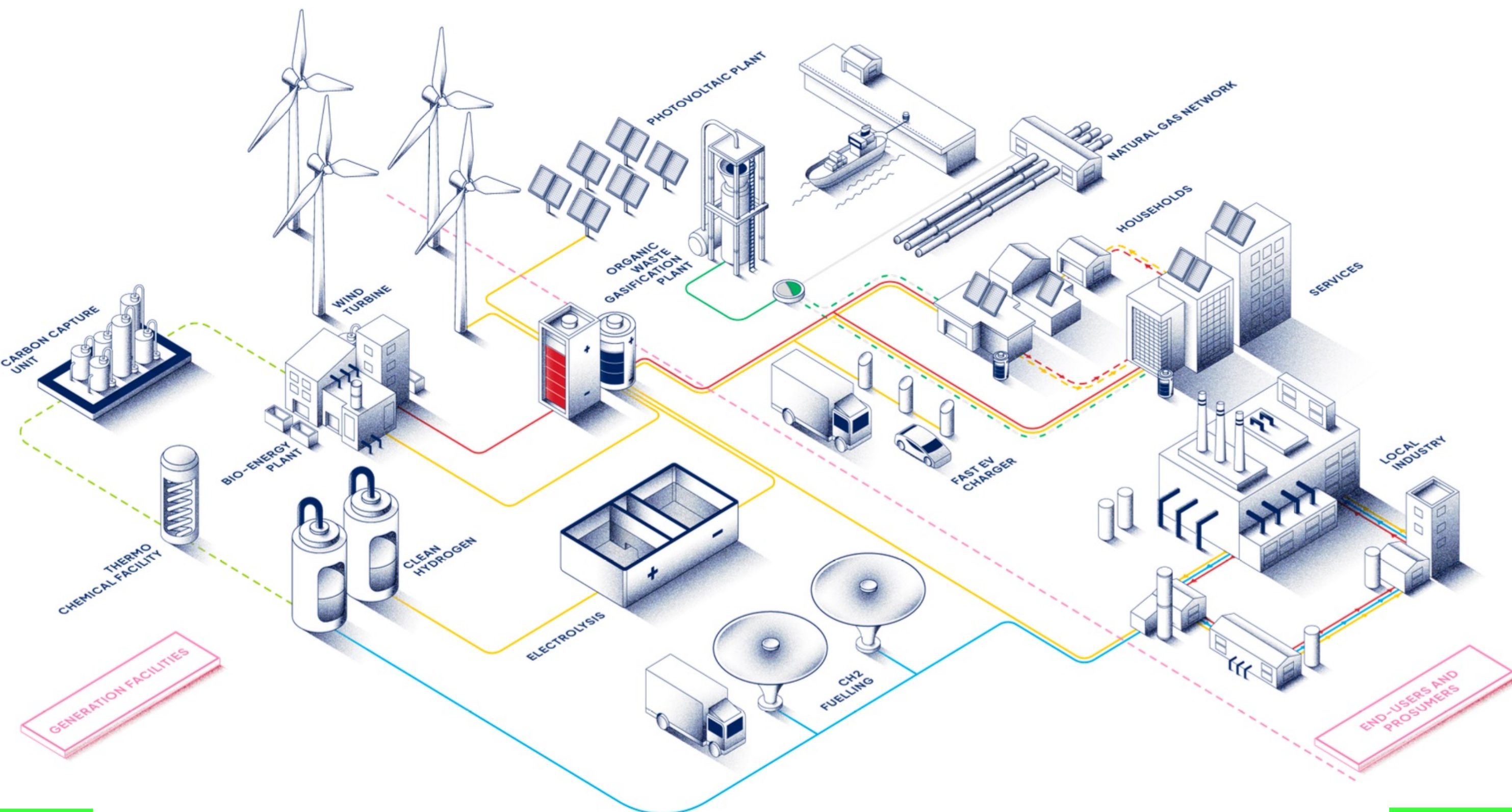
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INTRODUCING THE REFORMERS PROJECT

The Flagship Valley – a proof of concept:

- The Flagship Valley (FV) in Alkmaar, Netherlands will serve as a replicable approach for developing Renewable Energy Valleys (REVs) throughout Europe.



Towards European energy self-reliance:

The main ambition of the REFORMERS project is to **enhance** renewable energy supplies through **diversification and optimisation** of the overall efficiency of local energy systems. **The goal**, achieving **energy positive carbon neutral REVs**.

A systemic innovation approach:

- Integration of multi-energy vectors in local energy systems
- Advanced digital tools for REVs
 - Energy Valley Toolbox's for design and assessment of REVs
 - A Digital Twin blueprint
 - Multi stakeholder engagement
- Intelligent operational management

A FOUR-DIMENSION CHALLENGE:



AI visualization of the 4-dimension challenge. Source: DALL-E (ChatGPT).

Technical / Operational:

Evolving from assets efficiency towards **system efficiency**, to maximize renewable energy penetration. Facing infrastructural challenges and **electric grid congestion** towards a more reliable energy positive REVs.

Economic

Uncertainty on return on investment can deter **investors** in such large-scale projects. Ensuring the key points for the right deployment of resources is vital towards getting the **early stages** of the project to take off.

Environmental

Development of specific strategies on achieving a **decarbonized and self-sufficient** solution by means of quantified evaluation of the **environmental impact** of any given technological solution in any REVs

Social

Fostering the participation of the local industry and other **stakeholders**, including citizens and **Energy Communities**, in the whole value chain - design, implementation, and exploitation of REVs.

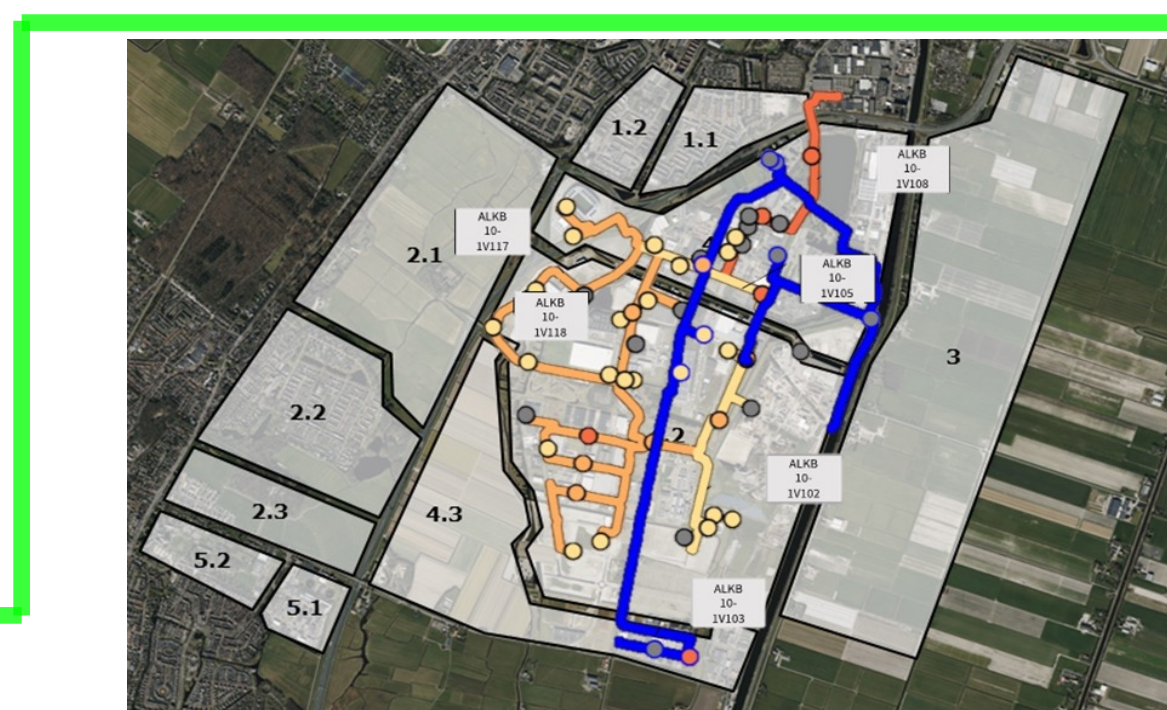
ENERGY SYSTEMS MODELING TO TACKLE THE DECISION-MAKING BOTTLENECK:

Multi-Energy System modelling:

REFORMERS will showcase **sustainable and cost-effective renewable energy production and storage** from various **local sources**, meeting the Valley's **annual energy needs**. It will also promote **gas supply diversification** through increased use of sustainable **bio-methane** from organic waste and agricultural residues, as well as **renewable hydrogen**.

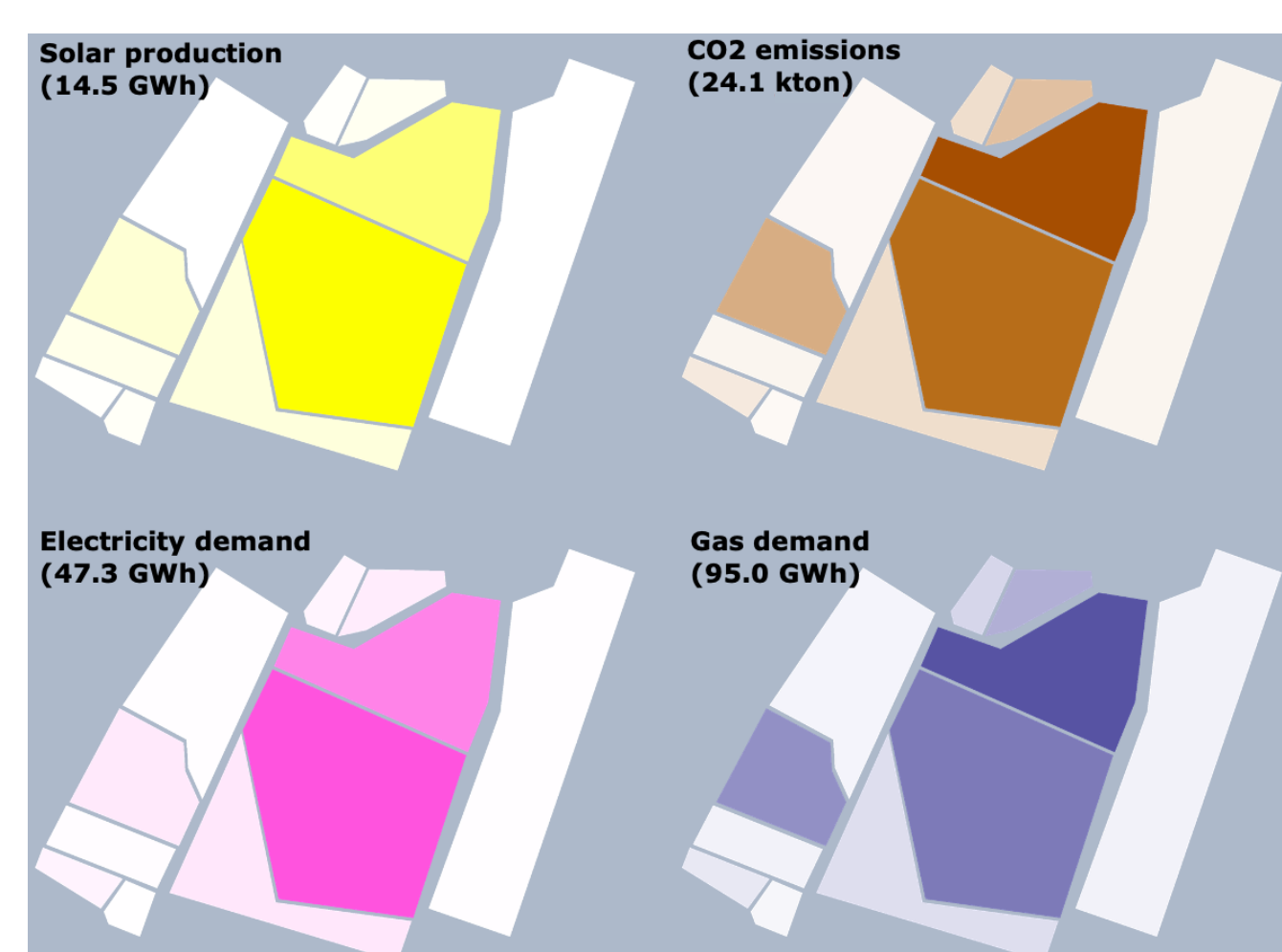


Turning a concept...



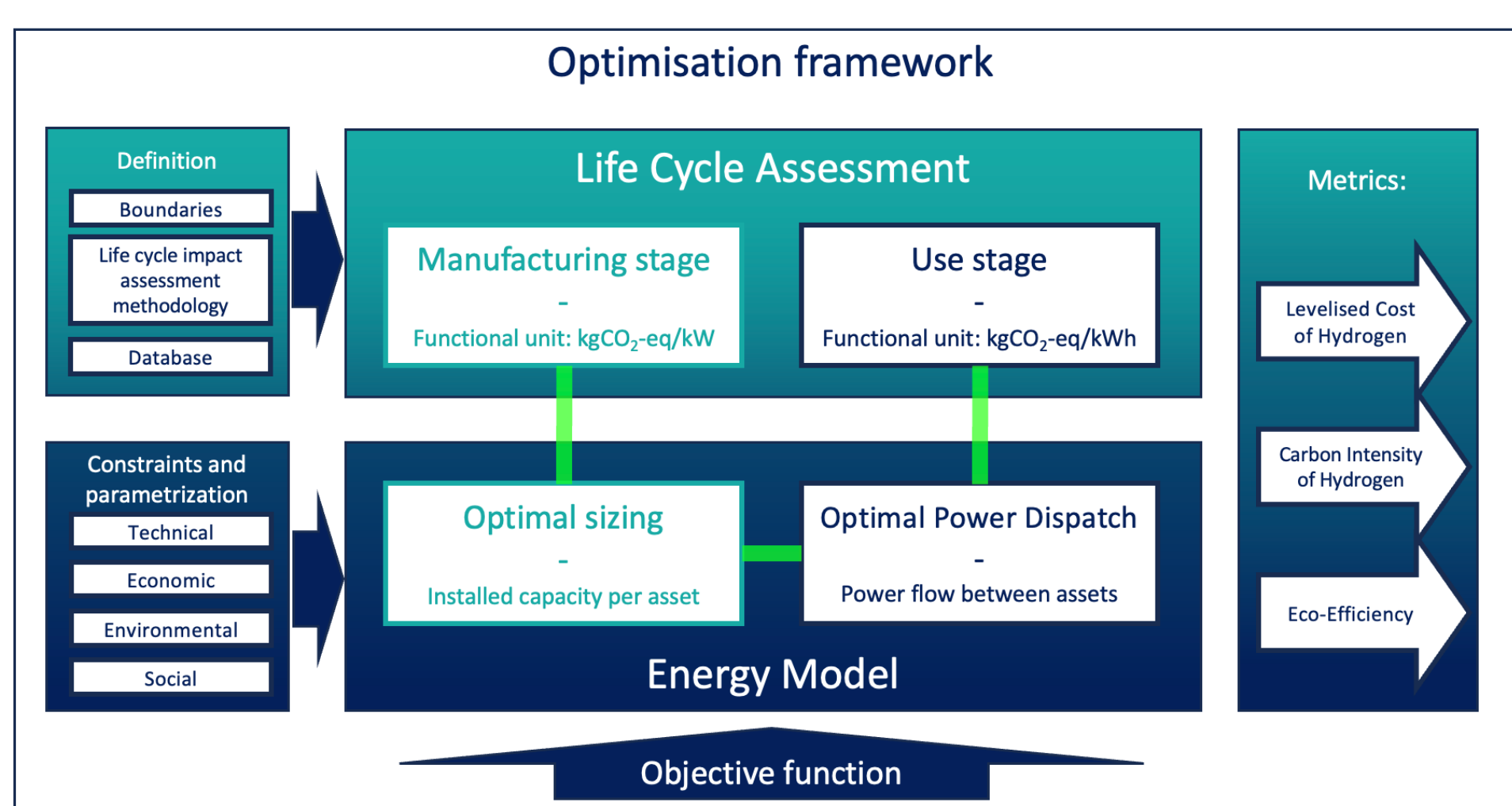
...into a model...

Accompanying the decision-making process with measurable targets and KPIs:



The definition of **scenarios** that are aligned with the **timelines and targets** of the Project, while addressing the needs from the different **stakeholders** is key towards **unlocking momentum at early stages** of the Project.

Integrating Techno-Economic optimization and Life Cycle Assessment:

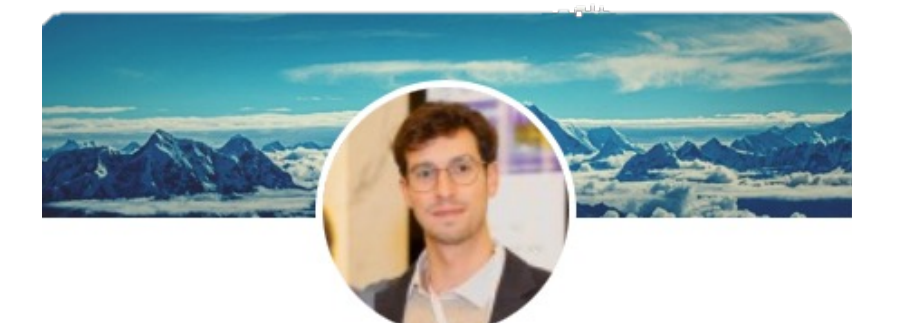


Support to the real action, a.k.a. implementation plan:

Infrastructural planning and implementation need to begin before the final design concept is achieved. Therefore, **energy modeling** is a key enabler in assisting the **early stages** of the project, ensuring consensus among stakeholders and **aligning the four dimensions consistently**.



The Flagship Valley: Alkmaar municipality and Boeklermeer industrial area.



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Multi-Energy System Modelling
Renewable Hydrogen

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Tentative PhD thesis title:

Hydrogen's role towards sustainable multi-energy systems:
Bridging the technical, economic and environmental dimensions.

Current and past work:

Techno-economic assessment on hybrid energy storage systems comprising hydrogen and batteries: A case study in Belgium.

*DOI: [10.1016/j.ijhydene.2023.06.282](https://doi.org/10.1016/j.ijhydene.2023.06.282)

Multi-state optimal power dispatch model for power-to-power systems in off-grid hybrid energy systems: A case study in Spain.

*DOI: [10.1016/j.ijhydene.2023.06.019](https://doi.org/10.1016/j.ijhydene.2023.06.019)

Phasing out steam methane reformers with water electrolysis in producing renewable hydrogen and ammonia: A case study based on the Spanish energy markets.

*DOI: [10.1016/j.ijhydene.2023.07.347](https://doi.org/10.1016/j.ijhydene.2023.07.347)

The effect of carbon taxonomy on renewable hydrogen production: Techno-economic and environmental assessment through a case study in Japan.

* Under review.

The role of renewable hydrogen and energy communities in carbon-neutral industrial HUBs.

* Under review.



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HORIZON EUROPE PROGRAMME

HORIZON-CL5-2023-D3-01-01

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EU Contribution: 19.65 Million EUR

5 years
November 2023 to October 2028

10 EU Countries

1 Flagship Valley
6 Replication Valleys



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