GREEN ENERGY PARK

COLLABORATING TODAY ON TOMORROW'S SOLUTIONS

Collaborating today on tomorrow's solutions

POWERED BY VUB VRIJE UNIVERSITEIT BRUSSEL

UZ Universitair Ziekenhuis Brussel

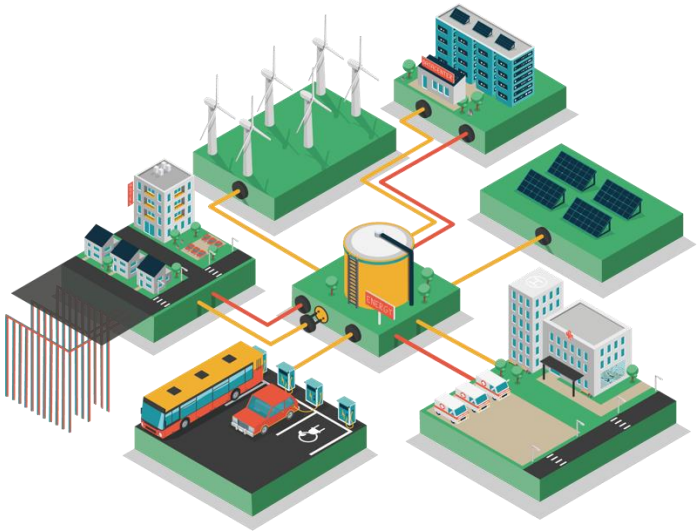
A brief history

It all started with the quest for a parking lot ….
and a small group of visionary entrepreneurs willing to make a big difference

What's next? Facelift of the entire researchpark where the sky is the limit

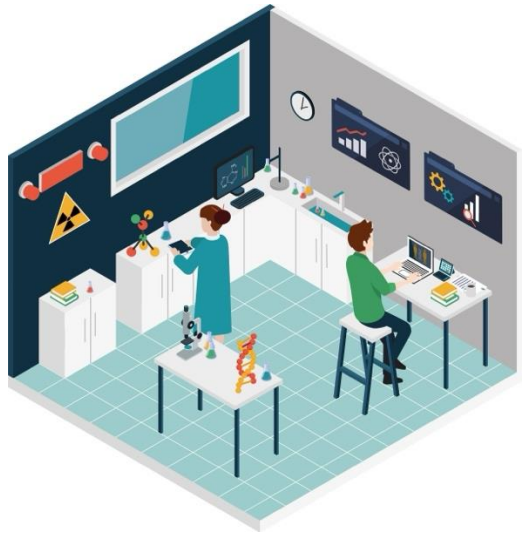
Our focus themes

ENERGY & CLIMATE



HEALTH

KEY ENABLING TECHNOLOGIES



The pillars

1 State-of-the-art buildings for laboratories and research infrastructure to accelerate R&D.

2 Large-scale, realistic living labs to bridge the gap between knowledge and economy.

3 A powerful ecosystem that allows companies to jump ahead by fostering collaboration.

4 The training and experience center that helps companies grow in innovation sectors.

State-of-the-art buildings for laboratories, research infrastructure and offices

NEXUS DATACENTER (IN USE)

ORIGIN (Q1 – 2027)

BUILDING 3 (TBC)

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H_2O neutraal CO_2 neutraal 2030

Nexus datacenter

This first **100% green data center** is the cornerstone of the CO2-neutral multi-energy grid on the Researchpark in Zellik.

The design is future-proof and focuses on maximal energy efficiency:

- the Southern façade is one big solar panel
- the heat from the servers is reused in a local heat grid to warm up nearby buildings
- rainwater is collected on the roofs of the data centre and surrounding buildings. It is used to optimise cooling by spraying it over the outside cooling units during hot and dry hours.
- Circular Architecture is used, so that the building can be taken apart with the metal and glass reused elsewhere.

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Origin

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Origin

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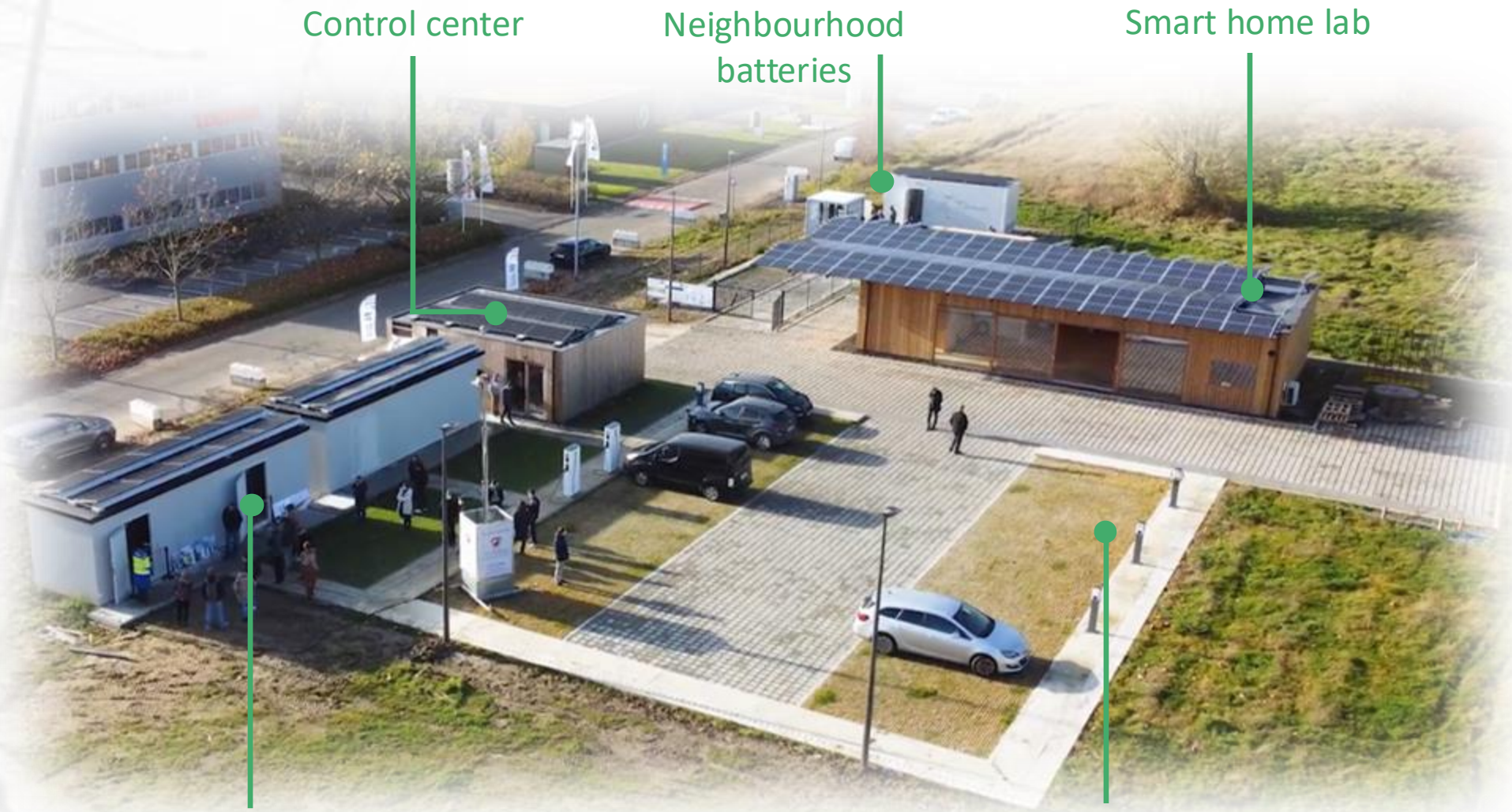
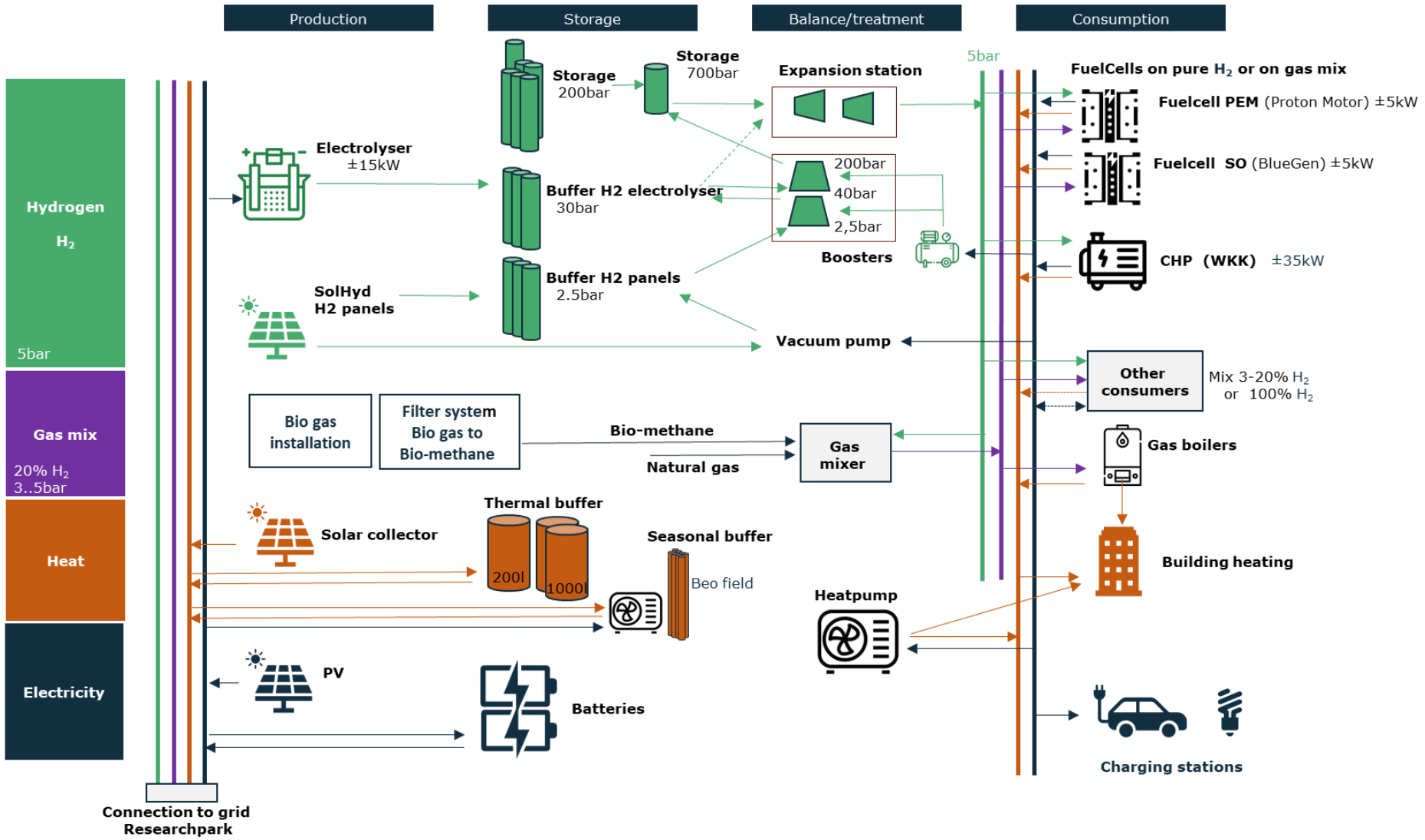
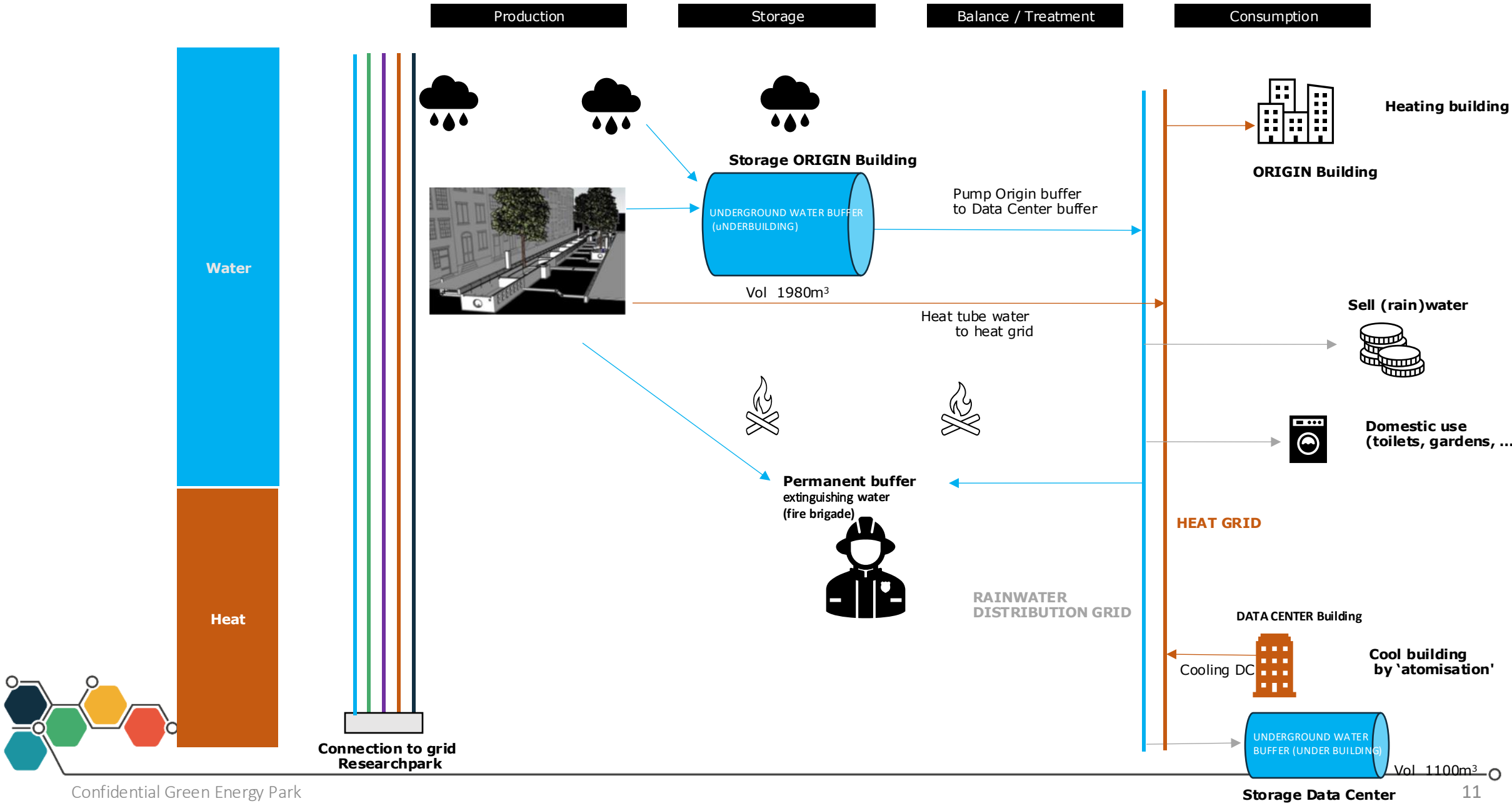
2 | Large-scale, realistic living labs



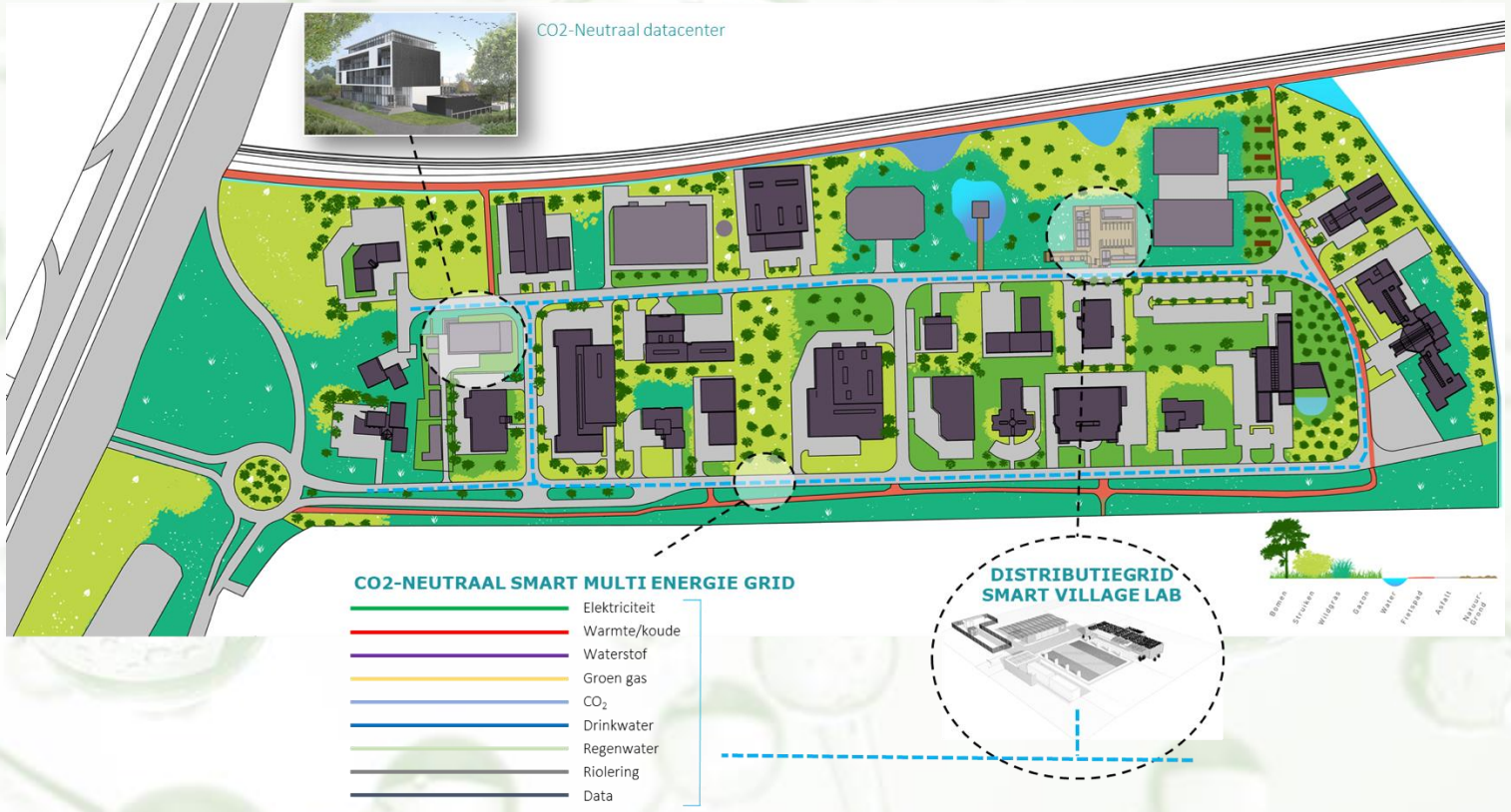
SMART VILLAGE LAB 2 : FUTURE (SMEL II + SMART DHYSTRICT)



SMEL II –deel 3 : FUTURE waterbeheer (Origin / Data Center)



LIVING LAB FOR THE INTEGRATION OF SUSTAINABLE GAS IN A MULTI-ENERGY SYSTEM



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VUB EVERGi RESEARCH GROUP

fluvius. flux50
ENERGISING THE FUTURE

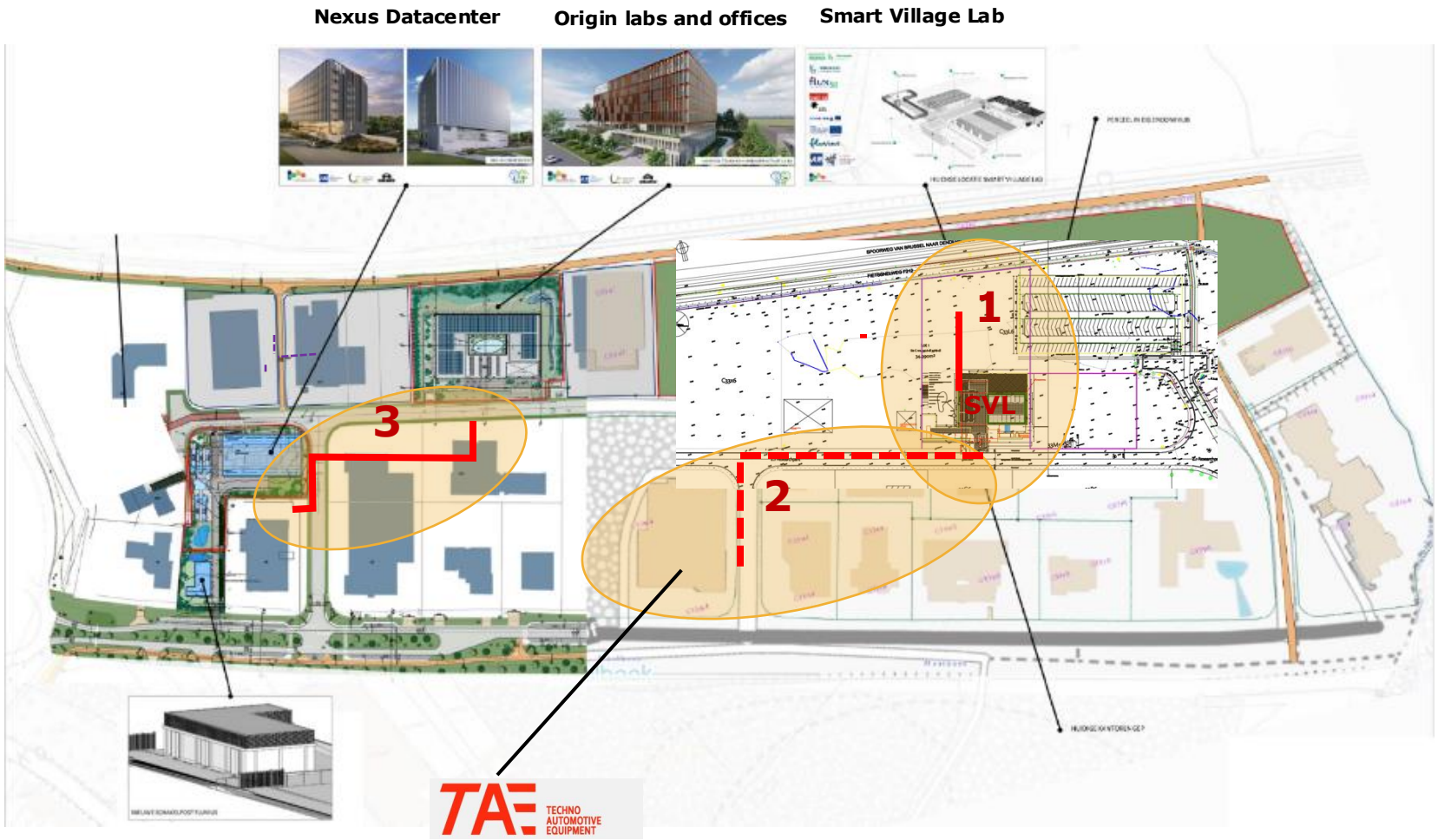
FLUXYS

WaterstofNet

gas.be

SMEL II

Part 1: expansion Smart Village Lab
Part 2: connection TAE
Part 3: connection Datacenter -Origin



Projects

Reconstruct

TIMING: JUNE 2023 – MAY 2027

Promote circularity in the European construction industry to reduce its significant environmental impact: this is the aim of Reconstruct, an EU-funded research project led by the Institut de Tecnologia de la Construccion de Catalunya (ITeC) and supported by a consortium of 16 institutions.

IB-Green

TIMING: MARCH 2023 – FEBRUARY 2027

Reduce heat stress at existing industrial and business parks by developing green and blue infrastructure: this is what 11 partners from Belgium, Germany, France, Ireland, Luxembourg and the Netherlands are seeking to achieve with their joint project IB-Green.

AMV-ELC

TIMING: SEPTEMBER 2023 – AUGUST 2026

With the aim of having enough professionals with up-to-date knowledge and expertise on the energy transition, Interreg Flanders-Netherlands launched the Labour Market Demand-driven Energy Learning Community project, known as AMV-ELC in Dutch.

4 | Training and experience center that helps businesses grow

We develop and create training material.

We offer general and specialized training, for which we work together with various partners. Training is available for beginners and experts.

EDURGY
leren over de energie van morgen

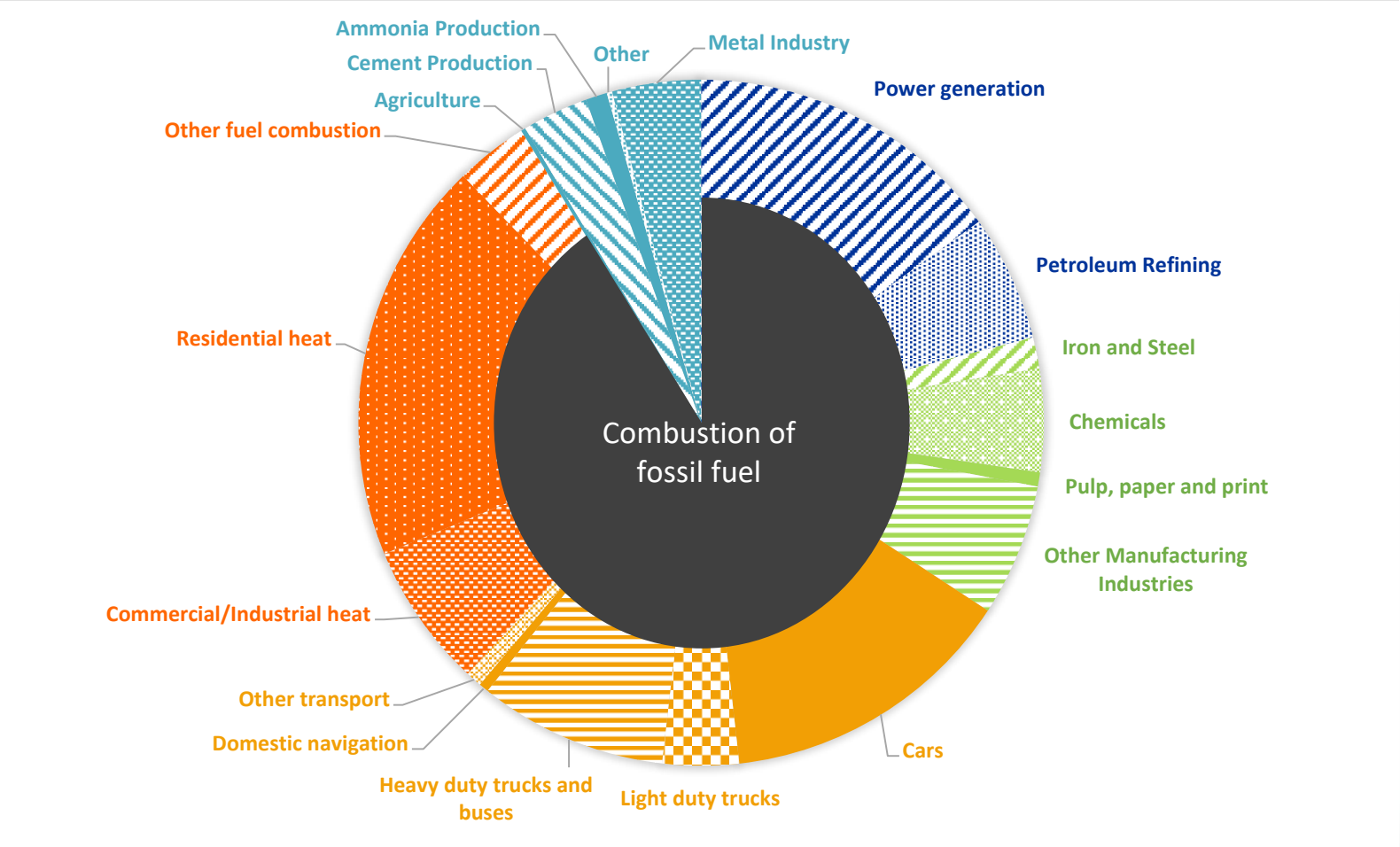
VRIJE UNIVERSITEIT BRUSSEL

VUB's future research on decarbonization technologies

PROF. THIERRY COOSEMANS

CO2 EMISSIONS PER SECTOR IN BELGIUM 2020

HOW TO GO TO ZERO?



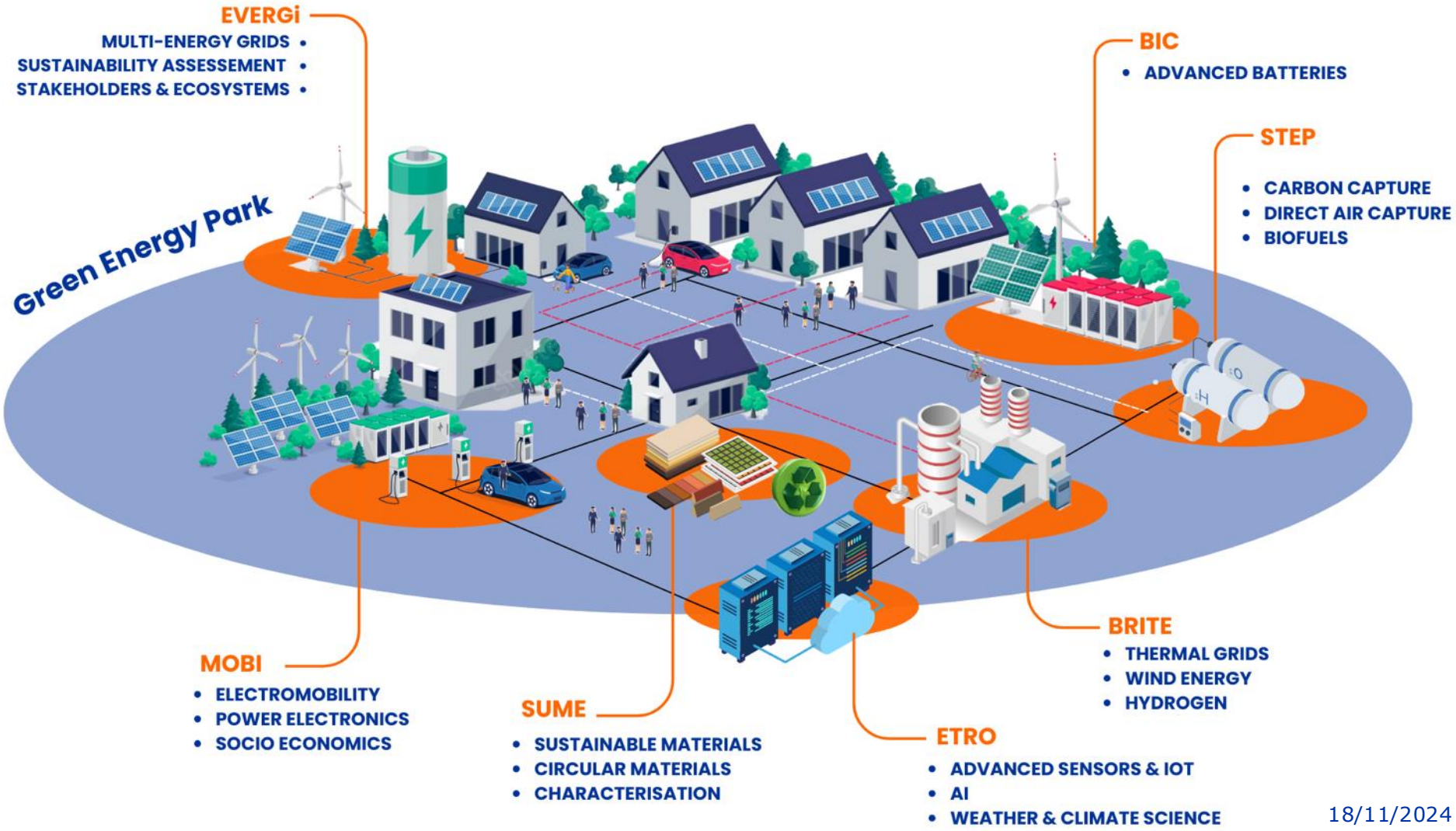
CLIMATE CRISIS = KEY CHALLENGE 21ST CENTURY

VUB FOUNDED FIDT ON 18TH OF MARCH 2024

FIDT was founded in the presences of the Flemish Minister President and Minister of Education

HOW TO GO TO ZERO CO2?

SYSTEMIC APPROACH & TECHNOLOGY PLATFORM FOR DEMONSTRATION



THE DECARB INSTITUTE IN SOME KEY FIGURES

Human resources

300
FTE

26 professors

Interdisciplinarity

6 R&D groups

3 Faculties:

- Engineering,
- Social Sciences and Solvay Business School
- Sciences and bioengineering sciences

Running projects

25
projects

25 Running projects 2024-2028

R&D budget

20M€ yearly turnover

5 IOF groups

Diverse Network

73
Network & Boards

- Member of 73 Networks & Boards
- R&D associations, authorities, regulators, industry, policy committees, NGO
- 19 LOIs for Advisory board

Living Labs @ VUB's innovation campus

NEXUS-DATACENTER (2023)

ORIGIN – OFFICE & TECHNICAL LAB (2024)

SMART VILLAGE LAB (2021)

BUILDING 3 (2025)

GREEN ENERGY PARK

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- Electricity
- Heat
- Water
- Natural gas
- Hydrogen
- Biogas

THE NEXT GENERATION THERMAL GRIDS

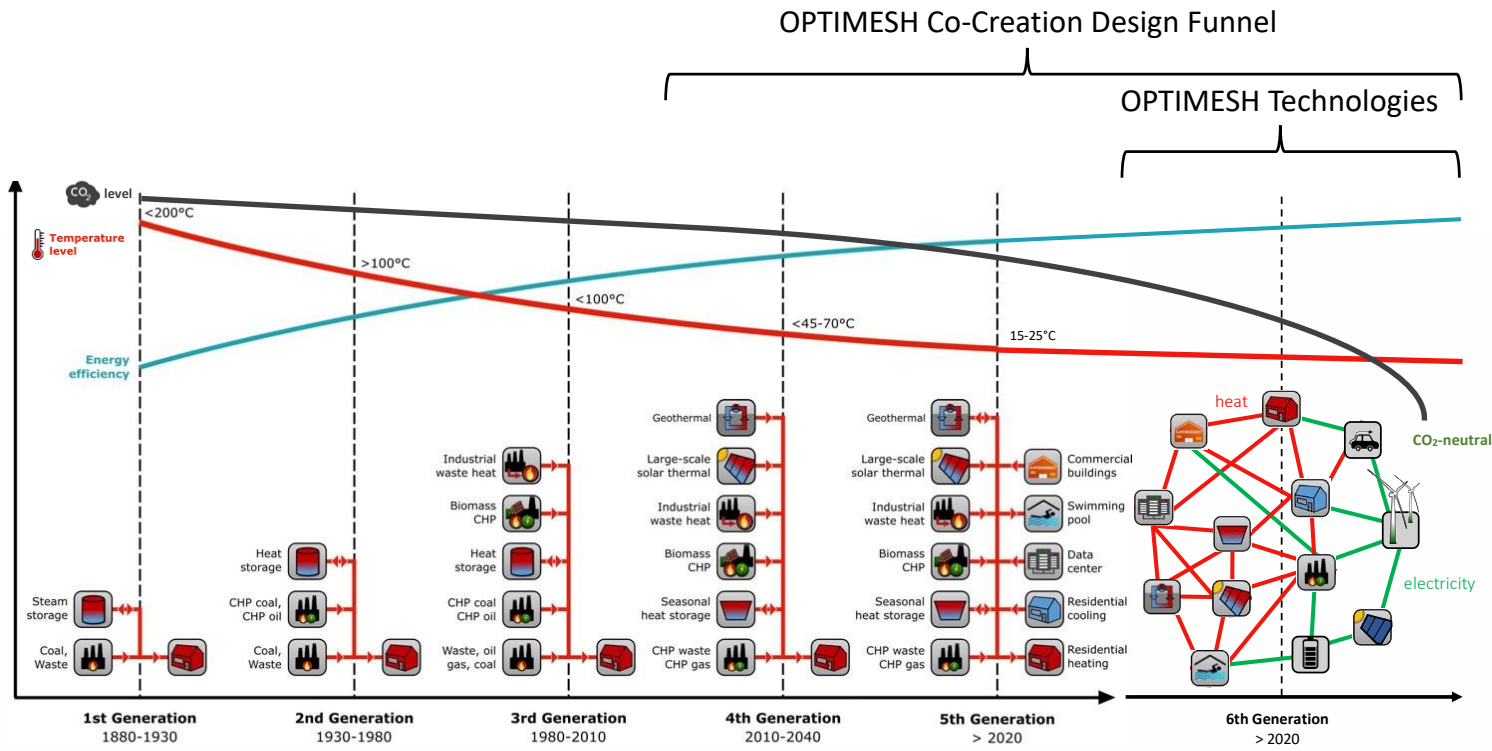
BRITE

Prof. Svend Bram
Prof. Julien Blondeau

OPTIMESH

OPTIMIZED THERMAL PROSUMER INTEGRATION IN A MULTI-ENERGY SYSTEM

- 6th generation thermal grids: P&P, meshed, heating and cooling grid
- Design funnel to scope potential
- Focus on transformation of business parks
- Multi-energy context



THE FUTURE OF SUSTAINABLE CHEMICAL PRODUCTION

Prof. Joeri Denayer,
Prof. Tom Van Assche

CARBON CAPTURE

Challenges

- Energy-intensive technology
- Relying on fossil energy sources
- Large chemical units

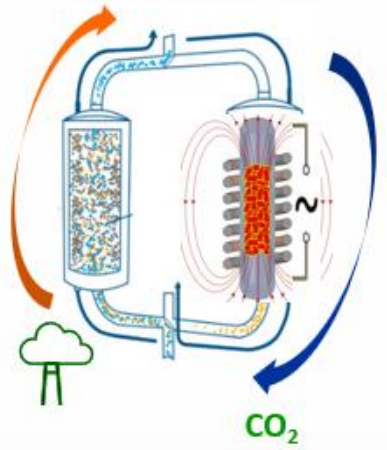
➔ **Reduce carbon footprint + Reduce cost + Broad-scale applicability**

CAPTIN

Flagship project

CAPTIN : Intensification and Electrification of carbon capture

- Intensification = efficient CO_2 capture
  + fast and efficient CO_2 recovery
- Electrification = use renewable energy
  + improve energy-efficiency
- Application for a range of point industrial sources



➔ **Economically feasible carbon capture by Inductive Heating based Swing Adsorption (IHSA)**

FLANDERS INDUSTRY INNOVATION MOONSHOT

https://www.moonshotflanders.be/en/projects/captin-2

THE FUTURE OF SUSTAINABLE MATERIALS

SUSTAINABLE MATERIALS ENGINEERING RESEARCH GROUP

Prof. Dr. Ir. Hubert Rahier
Prof. Dr. Ir. Annick Hubin
Prof. Dr. Ir. Tom Hauffman

RECONSTRUCT

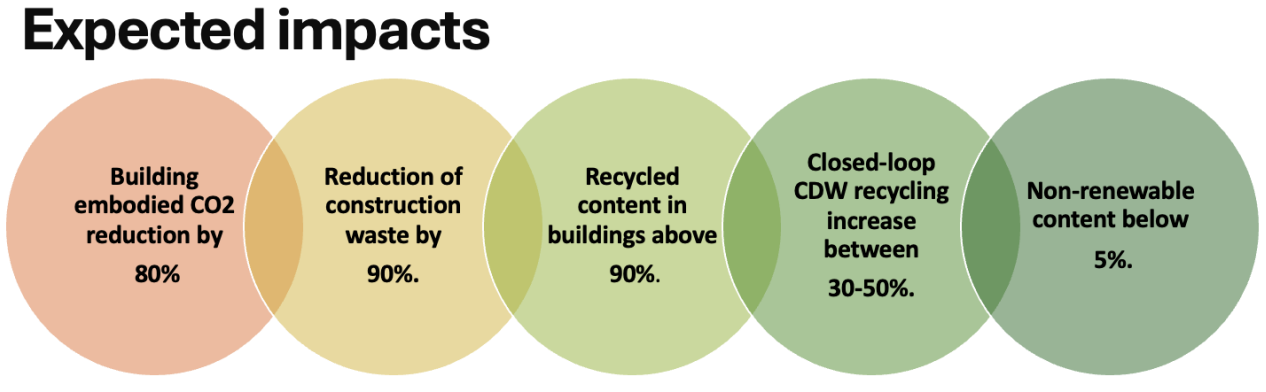
A TERRITORIAL CONSTRUCTION SYSTEM FOR A CIRCULAR LOW-CARBON BUILT ENVIRONMENT

Aim:

1. A full life cycle of construction, renovation, deconstruction and reuse/recycling for the built environment
2. Two real-scale demo buildings
3. Social innovation, policy roadmaps and co-creation of business models.

16 Partners

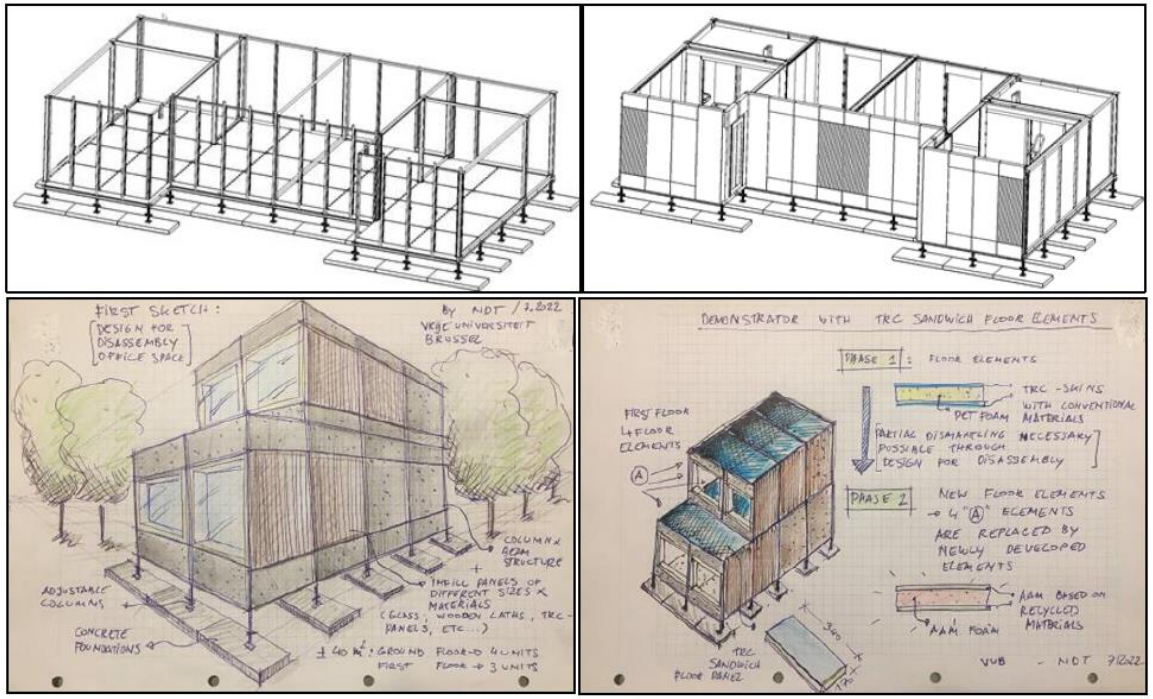
Started in 2023, 4 years



DEMO IN BRUSSELS
GEEN ENERGY PARK

1) Modular “forest office building”
2) Design for Disassembly/Reassembly
3) Two floors with circular floor system
4) Prefabricated construction with all its elements manufactured off-site but assembled on fixed foundations onsite.
5) “Open-source” construction components: targeted removal & replacement
6) Gradual upgrade by replacing them with materials and components with better circularity performance

Figure 7: Left: The structural frame is resting on removable concrete slabs Right: The wall panels can be replaced without compromising the structural integrity. Lower left and right: Conceptual design of the Belgian demonstrator



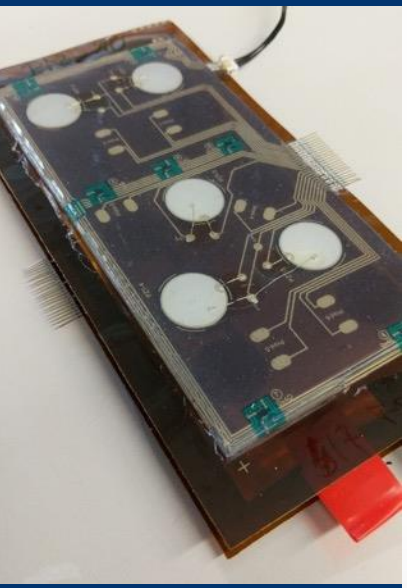
THE FUTURE OF SMART BATTERIES

Prof. Dr. Maitane Berecibar

VUB BATTERY INNOVATION CENTRE

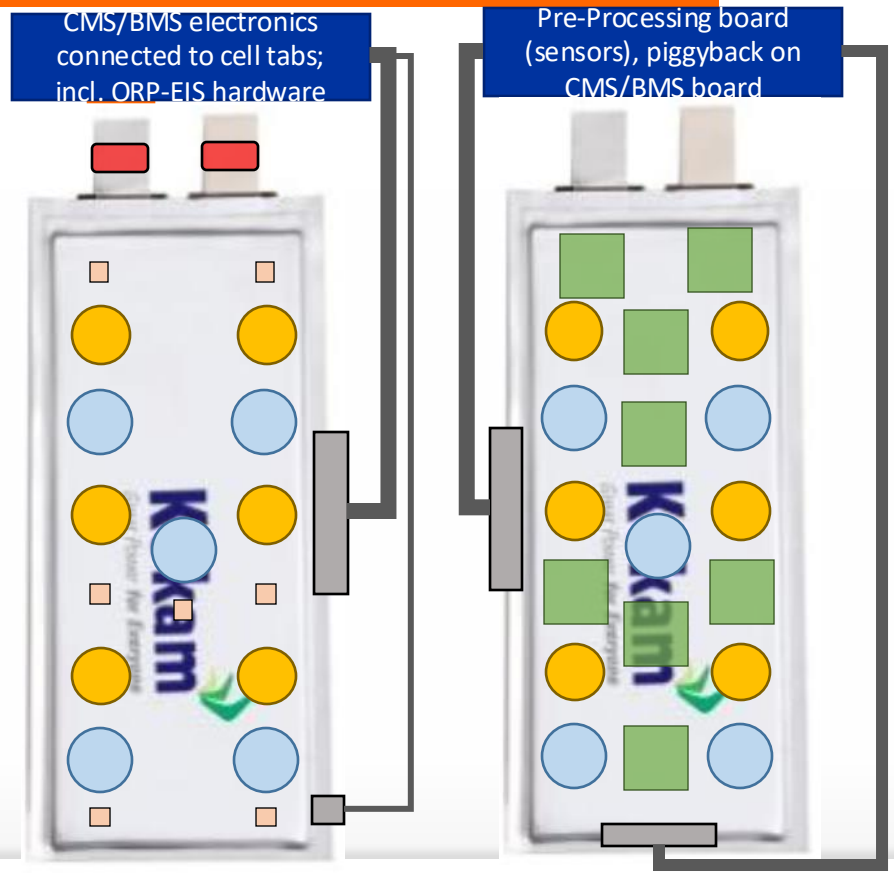
SPARTACUS OBJECTIVES

Develop & integrate battery sensors to detect spatial degradation of the battery in-operando



- Acoustic measurement PVDF: **6 pairs per cell (v1 – v3)**
- Acoustic measurement PZT: **5 pairs per cell (v1 – v3)**
  - → Reduction due to simultaneous use will be evaluated
- ORP-EIS: multiplexed, **1**
- Compression sensors: **8 per cell (v2 & v3)**
- Temperature sensor: **7 per cell (v2 & v3)**

- Electronics for sensors measurements, communication with CMS
- Crimped connectors: cabling for data transmission



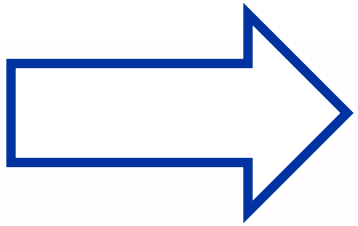
FUTURE RESILIENT ENERGY VALLEYS

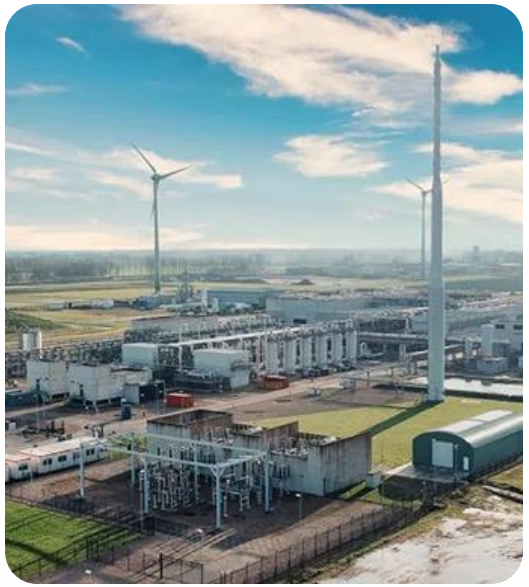
Prof. Dr. Thierry Coosemans

VUB EVERGi RESEARCH GROUP

THE STEP FORWARD

TRANSFORMING LES INTO REV





Local Energy Systems

LES are connected energy systems including renewable production, distribution, aggregation and consumption of several energy vectors, which are interconnected at the local level.

Renewable Energy Valleys

REV are defined as LES which are fully covering their local energy needs on an annual basis by means of renewable energy production.

THE FLAGSHIP VALLEY

INNOVATION TESTBED

Alkmaar Renewable Valley

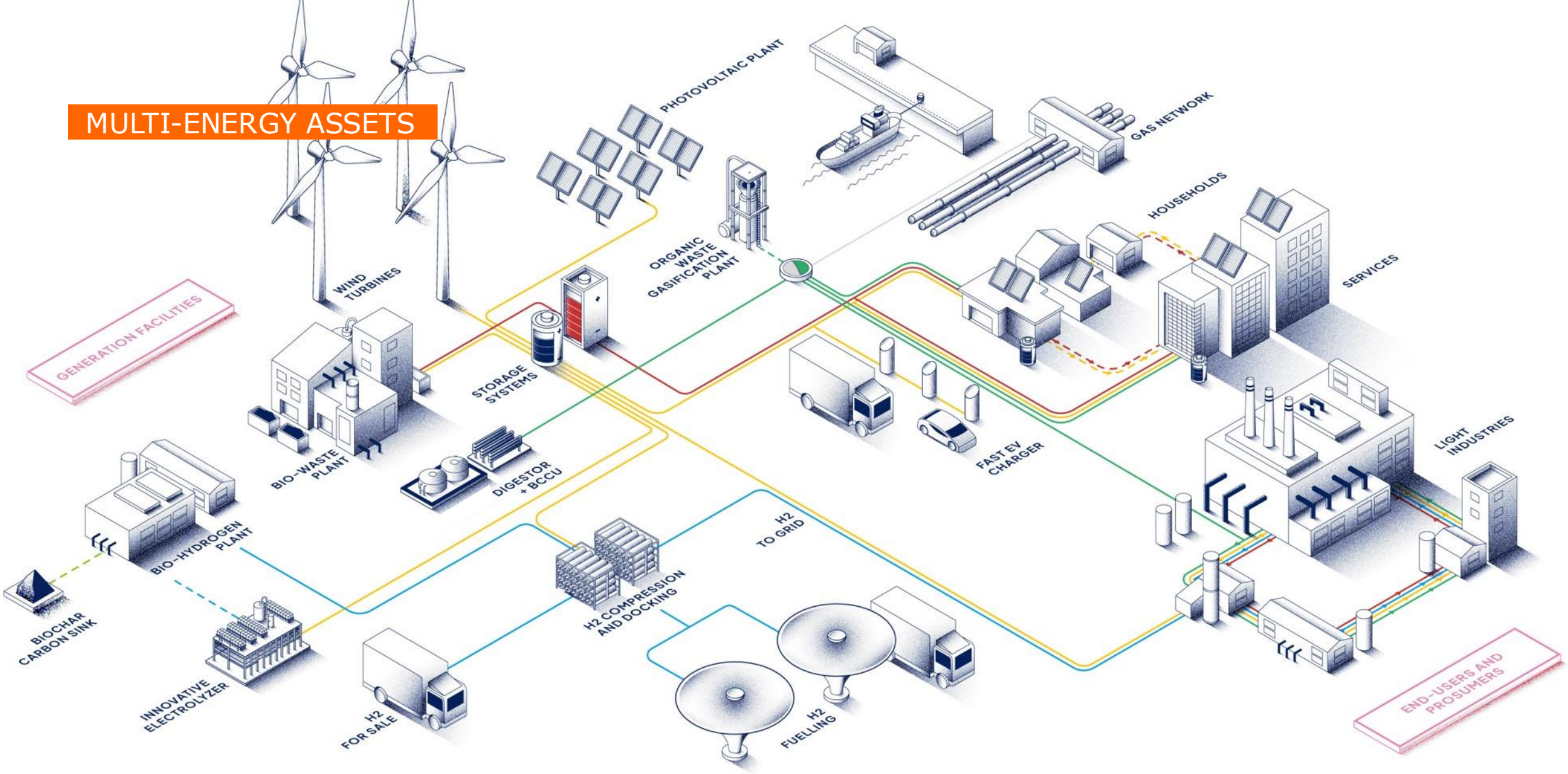
Medium-sized region

300 business facilities

3000 households

Diverse renewable energy sources: **solar, wind, and bio-energy facilities.**

MULTI-ENERGY ASSETS



MULTI-MODAL SENSOR SYSTEMS & NETWORKS: DATA SECURITY & MACHINE LEARNING

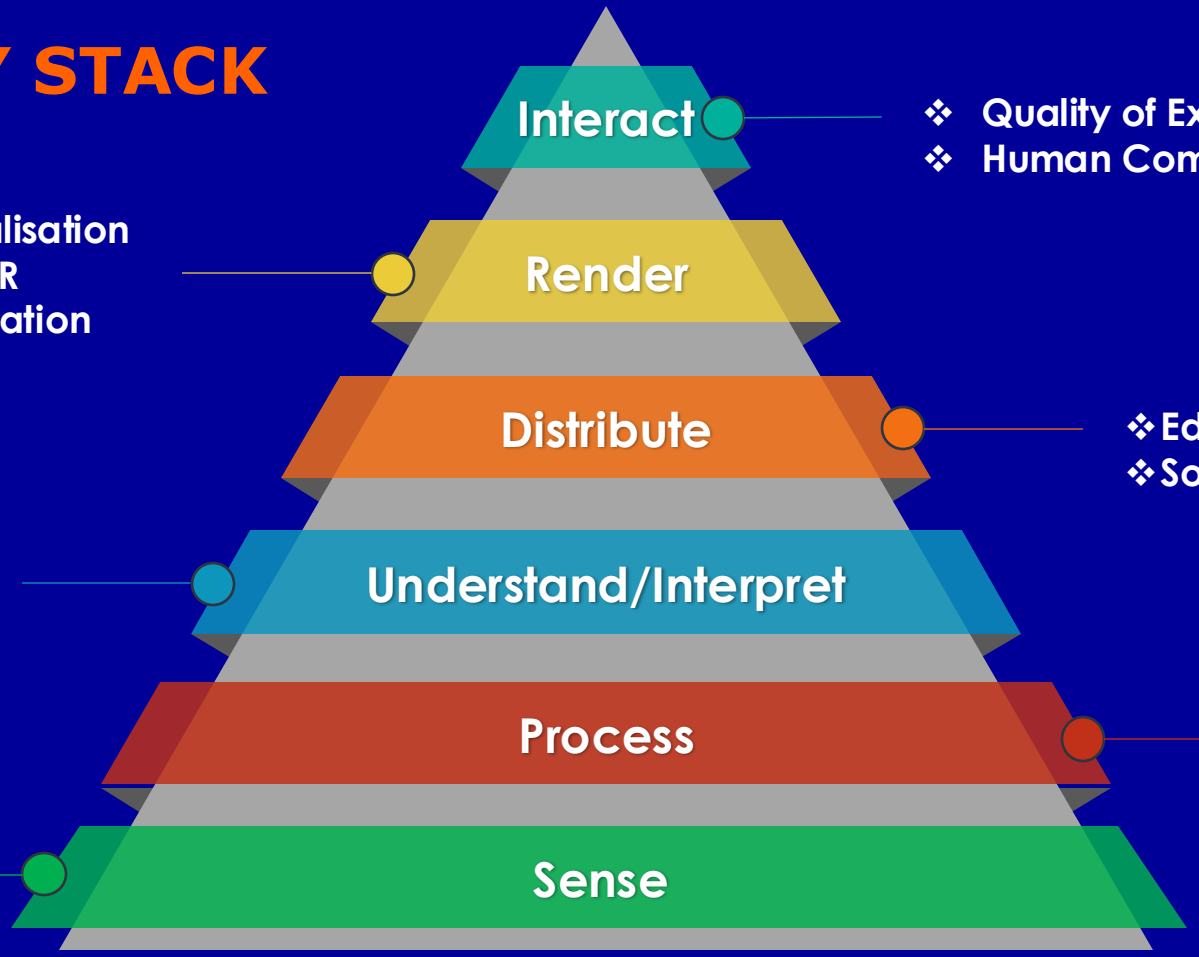
Prof. Johan Stiens

VUB ETRO ELECTRONICS & INFORMATICS
VUB INDI INDUSTRIËLE INGENIEURSWETENSCHAPPEN

ETRO.RDI'S TECHNOLOGY STACK

Signal Processing / Software

Hardware



- Quality of Experience (QoE)
- Human Computer Interface

- Visualisation
- AR/VR
- Animation

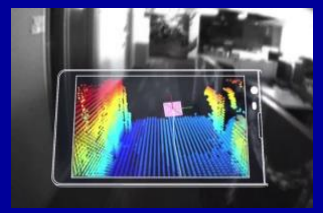
- Edge Computing
- Source Coding

- Artificial Intelligence
- Machine Learning

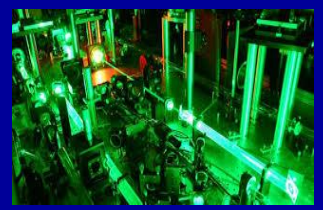
- Multi-modal, Low-level Signal Processing
- Computational Imaging
- Secure communication

- Sensor acquisition
- Imaging


HPC


Sensors


Semiconductor


Photonics


Electromechanics


Display


Computer Vision

From Fundamental Research to Valorization

A MULTI-MODAL DATA & AI DRIVEN APPROACH TO MAKE THE WORLD…

… A MORE SUSTAINABLE PLACE?

1. Smart energy-efficient sensor and networks
   (Radars, Lidars, 3D cameras, Acoustic Cameras, Wearables,…)
2. Data security & Encryption
3. A.I. based weather and Climate modelling
   (Focus on Urban environments)
4. Explainaible A.I & Federated Learning

ENACT

- ADAPATION MEASURES TO ENVIRONMENTAL & CLIMATE CHANGE EFFECTS IN URBAN ENVIRONMENTS

  ENVIRONMENTAL EFFECT ON HEALTH CARE AND WELLBEING AND ACTIVE INTERVENTIONS

Duration

Start date:

January 1, 2025

End date:

June 30, 2028

Funding

Eu Funding:
8.300.000 €

Coordinated by VUB

Horizon Europe programme

HORIZON EUROPE PROGRAMME
HORIZON-HLTH-2024-ENVHLTH-02-06

9 EU countries – 20 partners

Belgium, Netherlands, Estonia, Greece, Spain, Bulgaria, Finland, Ireland, Romania.

COUPLING THE MOBILITY AND ENERGY SECTOR

Prof. Dr. Cedric De Cauwer

HOW TO INTEGRATE ELECTRIC VEHICLE PARKINGS

CONTACTS AND INFO

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