SUSTAINABLE PLACES 2025

8-10 October 2025

Milano

Comune di Milano

R2M RESEARCH TO MARKET SOLUTION

DATA DRIVEN ENERGY TRANSITION

WORKSHOP

Digital twins, system resilience, and decision support

Planning the energy systems of tomorrow

Data-Driven Energy Transition

MELIXA

Luxembourg National Research Fund

THE NATIONAL CENTRE OF EXCELLENCE IN RESEARCH (NCER) - AN INITIATIVE BY FNR

IDAE

Instituto para la Diversificación y Ahorro de la Energía

www.sustainableplaces.eu

SUSTAINABLE PLACES 2025

In-person Workshop

Data driven energy transition:

Digital twins, system resilience and decision support for planning the energy systems of tomorrow

Day **3** Fri. 10 Oct. 14.00 - 15.30 CEST

Projects

D2ET •

MELIXA •

Data-Driven Energy Transition

MELIXA

SUSTAINABLE PLACES 2025

Agenda

14.00 Introduction
Joachim Geske

14.10 MELIXA
César Alberte Tapia

14.25 D2ET
Laura Andolfi

14.40 Q&A and Discussion
Moderated by Joachim Geske

MELIXA

Distributed control platform for flexibility markets integration

Contact: melixa@r2msolution.es
Linkedin: MELIXA-Plataforma

César Alberte Tapia, cesar.alberte@upm.es

Financiado por la Unión Europea NextGenerationEU
Plan de Recuperación, Transformación y Resiliencia

¿What is MELIXA?

“MELIXA – Distributed control platform for flexibility markets integration” is an innovative project that will develop a flexibility platform for local energy communities, sponsored by the initiative **‘Nuevos Modelos de Negocio’ from IDAE** (Instituto para la Diversificación y Ahorro de la Energía), in the context of the Spanish government’s **Plan de Recuperación, Transformación y Resiliencia.**

MELIXA consortium

MELIXA is a **multidisciplinary** consortium that gathers leading players in:

- Social sciences
- Intelligent networks technologies
- Data science and AI
- Edge intelligence and field implementation

R2MSpain:
An innovation company

Universidad Politécnica de Madrid:
A university and research community

Bamboo Energy :
A software and technology provider

IREC - Institut de Recerca en Energia de Catalunya :
A research center

MIWenergía :
An energy retailer

OMI - Polo Español (OMIE) :
The Spanish electricity market operator

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Objectives:

The goal of **MELIXA** is to develop a **multiservice, distributed control platform** for the **management of flexibility in local energy communities**, offering a practical and scalable approach to the integration of digital tools in the operation of local energy communities.

- Develop an **innovative bussiness model** for the exploitation of **flexibility**
- Push **demand side flexibility forward** and improve network services
- **Widen the range of services** offered by energy retailers
- Facilitate the **integration of local energy communities** in flexibility markets
- Implement **optimal control strategies** at a **building** level
- **Validate** the developed solutions in **real and virtual environments**

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Use case: ManzaEnergía

Optimization and validation in real and virtual environments through a digital twin

ManzaEnergía.

Local energy community located in Manzanares el Real, near the city of Madrid. Currently consists of:

- At least 5 public buildings and their users
- 15 families in a situation of energy poverty
- More than 30 members in the neighborhood energy association

PV installation

HVAC systems

Battery Storage Systems

EV charging

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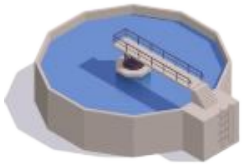
Use case: Mediana de Voltoya

Mediana de Voltoya.

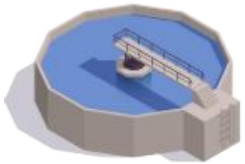
Local energy community in a small town in Ávila:

- Legally constituted energy community.
- Participation in Intelligent Rural Territory initiative.
- Water pumps as potential flexible assets.
- Monitorization of water tank states, flow rates, nitrates, and water pump use.

Virtual validation through a digital twin



Decantation tank



Water for consumption tank

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Data-Driven
Energy Transition

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NCER-D2ET PROJECT

SUPPORTING LUXEMBOURG'S ENERGY TRANSITION DECISIONS THROUGH DATA AND DIGITAL TWIN TECHNOLOGIES

Luxembourg National Research Fund
THE NATIONAL CENTRE OF EXCELLENCE IN RESEARCH (NCER) AN INITIATIVE BY LNR
LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY
LIST
LISER
Luxembourg Institute of Socio-Economic Research
uni.lu
SnT

Data-Driven
Energy Transition

Why this project?

1

Luxembourg depends heavily on imported energy.

- Nearly all electricity and gas are brought from abroad – this creates vulnerability in times of crisis.

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Why this project?

2

Climate targets are ambitious and approaching fast.

Luxembourg must reduce greenhouse gas emissions by 55% by 2030 (vs. 2005)
Major changes are needed now.

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Why this project?

3

Energy systems are becoming more complex

New technologies (like heat pumps, solar panels, hydrogen…) must work together – but we lack a tool to plan this properly.

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Why this project?

4

We currently have no unified platform to plan the future

Ministries, grid operators, and local communities lack a common system to simulate scenarios and make informed decisions.

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Our Mission

Our mission is to accelerate Luxembourg's energy transition in a way that is sustainable, affordable, and socially acceptable

by empowering all stakeholders to make informed decisions,

supported by the country's leading expertise in energy, computer science, and social sciences.

Data-Driven
Energy Transition

Our Vision

We envision Luxembourg as a European leader in innovative, data-driven energy solutions, tackling the most pressing societal challenges through research and collaboration.

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Energy Transition

NCER D2ET project objectives

- Accelerating the energy transition with a national platform
- Improving decision-making through co-creation and engagement
- Understanding the impacts of the energy transition
- Ensuring long-term value and outreach

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Energy Transition

Financial & Human Resources at a Glance

30.2M€
Total Project Budget (8 years)

13.2M€
FNR Financial Contribution

15.4M€
Co-investment of Contracting Partners

1.6M€
Industrial in-kind co-funding

2232
Person-Month over 8 years

57
Experts Involved from Contracting Partners

9
New **PhDs in Phase 1**

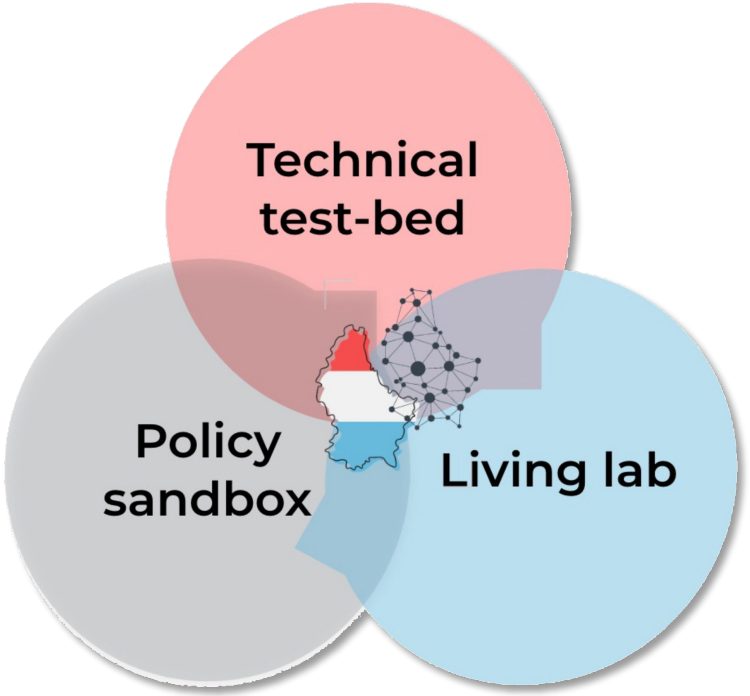
8
New **Postdocs in Phase 1**

What is the D2ET national platform?

The D2ET platform will be a shared space to test ideas, learn together, and make better decisions about Luxembourg's energy future.

- Researchers will use it to develop and explore innovative solutions.
- Companies and public actors will be able to test energy technologies before investing.
- Policymakers will gain insights to assess and improve regulations.
- Citizens will have more control over their data and a stronger voice in the energy transition.

Over time, D2ET will become a model for tackling complex societal challenges, starting with energy, and expanding to other areas through data and collaboration.



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3 scenarios

For Phase 1

Scenario 1: Heat-pump Vs District Heating

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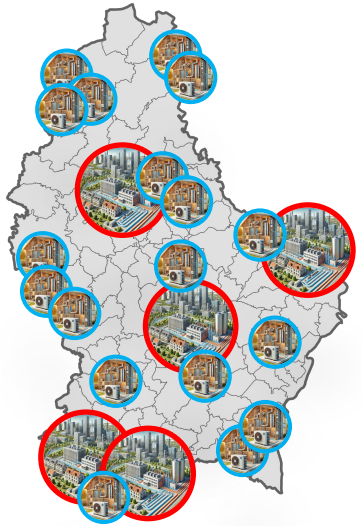
Attribute	Heat-Pumps	District Heating
Costs	High upfront, flexible	Infrastructure-heavy
Efficiency	Medium	High
Market Structure	Competitive	Monopolistic
Decarbonization Potential	Good	Excellent

MOTIVATION

- Decarbonizing Luxembourg's heating sector to meet climate goals.
- Addressing the ***trade-off*** between **Decentralized** (*Heat Pumps*) and **Centralized** approaches (*District Heating Systems*).
- Enabling informed decision-making through innovative digital tools.



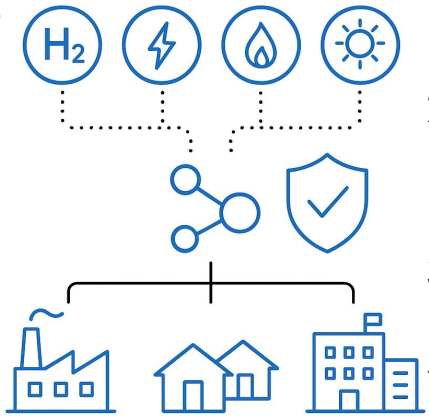
GOALS

1. Develop a DT with a comprehensive simulation framework for heating solutions.
2. Model practical use cases of energy transition challenges.
3. Enable smooth integration of findings in Phase 2 to ensure scalability.

Scenario 2: Multi-carrier guarantee of supply

MOTIVATION

- Ensure energy security while integrating multiple carriers to meet an ever-increasing energy demand
- Manage high operational complexity, market design, environmental and social impacts, technological advancements, and regulatory frameworks



GOALS

1. Identify synergies and reduce vulnerabilities
2. Provide a comprehensive understanding of the energy system
3. Foster reliability, resilience, & flexibility
4. Align national and EU energy policy

Scenario 3: Deployment of Energy Communities

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MOTIVATION

- Energy Transition Needs: Enable decentralized energy production and consumption
- Local Autonomy: Increase local energy independence and sustain
- Stakeholder Empowerment: Empower stakeholders collaboration (consumers, producers, prosumers).
- Regulatory Alignment: Align with regulatory framew renewable adoption.

GOALS

1. Establish tailored Energy Communities in Luxembourg.

Integrate renewables, storage, EV fleets, heat pumps, district heating, …

Develop IoT-enabled tools and platforms.

Model technical, financial, regulatory, social and environmental aspects.

Reduce grid investment needs through services provision.

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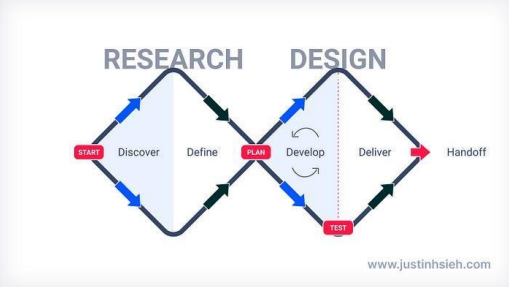
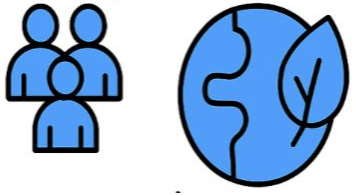
Decision-Making Support & Impact Evaluation



Living Labs will be set up for each scenario, using a Double Diamond approach to co-create and test ideas with users.



The societal and environmental impact of each scenario will be assessed, focusing on how decisions affect people and the planet.

Special attention will be given to the overall performance of the D2ET platform and the quality of results produced through the scenarios.

Data-Driven Energy Transition

Decision-Making Support & Impact Evaluation

Key evaluation dimensions

- User engagement and satisfaction
- Efficiency of decision-making processes
- Platform performance and reliability
- Quality of data and analytics
- Return on investment of the platform
- Effectiveness of training and support
- Contribution to research and innovation

Evaluation methods

- Surveys
- MCA — Multi-criteria analysis (MCA)
- Group discussions

What D2ET Delivers

- System-Level Value Created
  - Resilience & energy sovereignty
  - Tech transfer, training, spinoffs
  - Smarter policy and regulatory design

Long-term enablers for a sustainable, secure, and innovation-driven transition

- Concrete benefits for Luxembourg
  - Empowered policymaking
  - Lower CO_2 emissions
  - Better planning with real-time simulations
  - Citizen participation & transparency
  - Stronger research & innovation ecosystem
  - Data-driven energy market design

Immediate, visible impact for institutions, citizens, and the economy

Thank you !

Data-Driven Energy Transition

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Keep in touch!

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Find out more on our website and follow us on LinkedIn for the latest updates.

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