VRIJE UNIVERSITEIT BRUSSEL

The faculty of Engineering of the Vrije Universiteit Brussel invites you to attend the public defense leading to the degree of

DOCTOR OF ENGINEERING SCIENCES

of **Jonathan Hachez**

The public defense will take place on **Wednesday 25th November 2026 at 5pm** in the **Green Room** (U-Residence, VUB Main Campus)

To join the digital defense, please click here

TOWARDS ROBUST MUTUALIZED ENERGY SOLUTIONS SIMULATIONS OF ENERGY COMMUNITIES AND PLANNING OPTIMIZATIONS OF DISTRICT HEATING AND COOLING NETWORKS

BOARD OF EXAMINERS

Prof. dr. ir. Dries Peumans

Prof. dr. ir. Dimitrios Angelis

Prof. dr. ir. François Maréchal

Prof. dr. ir. Lesia Mitridati

Prof. dr. ir. Svetlana Ikonnikova

PROMOTORS

Prof. dr. Svend Bram

VRIJE UNIVERSITEIT BRUSSEL

Abstract of the PhD research

Fossil fuels are fantastic substances: we use them to heat our homes, travel, and power our industry. However, we must reduce our reliance on them because their use drives climate change and increases our dependence on energy imports, which weakens us geopolitically. One of the areas that can and needs to be decarbonised in priority is space heating and cooling: together, they account for half of Europe's final energy consumption. This thesis covers three areas of research aimed at providing a holistic solution to the challenges that energy modellers face today. First, it quantifies the thermal and electrical energy consumption of end users and communities, balancing parameter interpretability with output uncertainty. Second, it optimises the layout of a thermal grid in Brussels and the temperature levels of an anergy grid in Mechelen. Finally, it robustly plans heating and cooling supply across three locations (Central Europe, Stockholm, and Brussels) and demonstrates the savings that incorporating risk into planning can yield. Taken together, these contributions form an integrated pipeline from demand characterisation to infrastructure design to uncertainty-aware planning, offering European cities a locally governable path toward affordable, resilient, and decarbonised thermal energy systems.