

## **PhD Position: Integrating Large-Scale Geothermal Borefields into District Heating & Cooling networks**

**Université libre de Bruxelles (ULB)**

### Research context

District Heating and Cooling (DHC) networks are increasingly recognized as efficient infrastructures to integrate renewable energy sources on a large scale. Among these, shallow geothermal energy offers a reliable and sustainable solution, with borehole heat exchangers enabling seasonal storage and stable supply. However, the large-scale integration of geothermal borefields into DHC networks raises key scientific and technical challenges, such as optimal design and control, interaction with network dynamics, and long-term thermal sustainability. Addressing these requires advanced modelling, simulation, and validation approaches, which form the core of the proposed doctoral research.

The project will focus on a large-scale geothermal borefield in Brussels, currently under extensive monitoring. The experimental setup provides a rich dataset combining heat pump operating data, calorimetric measurements along hydraulic loops, and vertical ground temperature profiles from fiber Bragg grating (FBG) sensors. This diversity of data offers a unique opportunity to characterize borefield thermal behavior, validate advanced heat transfer models, and optimize their integration in DHC networks.

The overall scientific objectives are:

- i. To carry out an integrated and comprehensive analysis of the data collected at the borefield, addressing both the performance of the energy system and the thermal interactions between borehole heat exchangers.
- ii. To develop a modelling framework for subsurface heat transfer processes, making full use of the extensive dataset collected on the borefield.
- iii. To design and evaluate optimization strategies for DHC network performance, accounting for network dynamics and the storage capacity of the geothermal reservoir.

### Profile

We are looking for an enthusiastic and highly motivated PhD candidate to work on this research topic, with a background in geotechnical engineering, civil engineering, geological or environmental engineering, energy engineering, mechanical engineering, or geosciences. Strong skills in mathematics and programming are considered an asset. Experience with the processing of FBG fiber optics will be regarded as a strong advantage.

### Research environment

The thesis will be carried out at Université libre de Bruxelles (ULB) under the supervision of Prof. P. Gerard and Prof. C. Caudron, within the framework of the ILES project (Integrated Local Energy Systems) funded by the Wallon Region. ULB offers a dynamic research environment in the field of geotechnical and geoenvironmental engineering, geophysics and geosciences, respectively in the Department of Building, Architecture and Town Planning

(BATir, ULB - <https://batir.polytech.ulb.be/>) and the G-Time department (G-Time, ULB - <https://gtime.ulb.be/>).

The PhD candidate will work within a broader framework involving several researchers focusing on geothermal energy in the teams of the supervisors, as well as two partners involved in the project and focusing on the integration of open-loop geothermal systems and mine-water geothermal energy in DHC networks. This collaborative setting will provide opportunities to exchange expertise.

#### Practical information

The position is available immediately. The estimated duration is 4 years.

**Application deadline** (detailed resume + motivation letter + names and e-mail addresses of two referees who may be contacted by those in charge of evaluating applications) : 1<sup>st</sup> October 2025.

**Further enquiries** on the vacancy and application must be directed to Prof. Pierre GERARD ([gerard.pierre@ulb.be](mailto:gerard.pierre@ulb.be))