

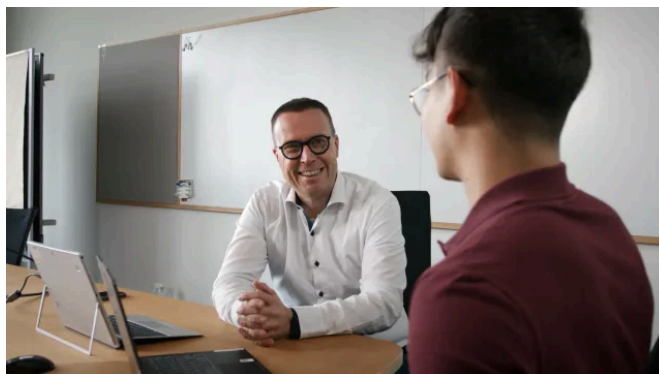
Master Thesis Data-Driven Identification and Forecasting of Thermal Flexibility in Residential Heat Pump Systems

JobID

REF296289E

Job posted

2026/09/23



Location

Renningen



Contract

Full-time, fixed-term



Starting date

According to arrangement



Join as

Student



Legal entity

Robert Bosch GmbH

Job-related questions

Ana Constantin (Functional Department)

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Task

Residential heat pumps can provide electrical flexibility by utilizing the thermal storage available in buildings, domestic hot water (DHW) tanks, and buffer storage systems.

This Master's thesis focuses on the automated estimation and forecasting of the flexibility potential of residential heat pump systems. Building on existing concepts and methods, you will investigate how thermal characteristics and storage capacities can be identified from monitoring data and used to quantify the flexibility that a heat pump system can provide.

- You will review existing approaches, analyze field monitoring data, and define suitable data processing workflows. Based on this data, you will identify key thermal parameters of buildings and storage systems and use them to estimate available flexibility over time.
- Furthermore, you will integrate the developed models into a flexibility forecasting workflow and evaluate their performance using real-world data. The analysis will cover both individual homes and aggregated fleets of heat pumps, including the impact of aggregation on flexibility estimation and forecasting accuracy.
- As part of the thesis, you will extend and validate an automated end-to-end workflow covering: Data preprocessing and quality assessment, Thermal system characterization, Estimation of thermal storage capacity, Flexibility estimation and forecasting, Analysis of individual systems and aggregated fleets.
- Finally, you will evaluate the developed approach.

Profile

- **Education:** Master studies in the field of Computer Science, Energy Technology, Energy Engineering or comparable
- **Experience and Knowledge:** of Python; experience with databases and knowledge of heat pump systems advantageous
- **Personality and Working Practice:** you are a reliable, curious individual with a strong internal motivation and a willingness to learn new things
- **Work Routine:** partially mobile working is possible, with work on premises at 60% (three days a week)
- **Languages:** business fluent in German and English

Work
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