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| KIT-Campus Nord | ITES | Postfach 3040 | 76021 Karlsruhe | **Institut für Thermische Energietechnik  und Sicherheit (ITES)**  Leiter/in: Prof. Dr. D. Banuti  Wiss. Betreuung:  Prof. Dr. D. Banuti  Hermann-von-Helmholtz-Platz 1  76344 Eggenstein-Leopoldshafen  Telefon: 0721 6082-3451  Fax: 0721 6082-4837  E-Mail: secretary@ites.kit.edu  Web: https://ites.kit.edu |
| **Master Thesis / Bachelor Thesis:**  **Data analysis of the German  industry heat potential**  **(numerical, theoretical)** |

“Heat is half”: Half of the German energy demand is for heat, that’s (slightly) more than electricity and transport *combined*. While more than half of electricity production has been converted to renewable sources, this only amounts to an *eighth* of the German overall energy demand in Germany. For heat, we are stuck below 20% renewables, particularly for high-temperature industry heat, reusing waste heat seems like a promising pathway.

In order to foster this, the German government now has established a waste heat database for energy-intensive industries which lists companies, locations, power and temperature levels.

The goal of the thesis is to perform exploratory data analysis on this database to identify possible clusters of similar heat profiles, to establish an overview of available heat sources, and to suggest follow-up usage of the energy sources.

The thesis requires

- interest in the heat transition and high-temperature processes

- knowledge in thermodynamics / heat engines / heat transfer

- experience or interest and willingness to learn Python/Jupyter notebooks for data analysis   
and applicable packages (e.g. scikit-learn)

Specifically, the work will involve

- literature research on regional waste heat potential

- developing suitable data analysis and visualization pipelines in Python

- exploratory data analysis of the available data

- preparation of visualizations that aid in understanding

- preliminary thermodynamic analysis of potential use cases

- documentation and dissemination (thesis, presentation, possibly paper) of the work

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