

Bachelor's Thesis

Mapping Europe's Hydrogen and Renewable Gas Infrastructure



Motivation

While the expansion of renewables in the power system is progressing at large scale, the **European gas sector** still relies on **95% natural gas**. To decarbonize the gas sector and achieve **climate neutrality**, it is envisioned to make the gas system accessible for bulk quantities of renewable/low-emission hydrogen and hydrogen-based gases and facilitate the use of bio-based gases. **The goal of this Bachelor's thesis** is to gather techno-economic data of hydrogen and biogas infrastructure and incorporate it into the Institute's energy system modeling database using the **interactive gas infrastructure tool QGas**. This includes:

- **Mapping production and storage infrastructure** such as electrolyzers, steam-methane reformers (with carbon capture and storage), bio-gas facilities, and large-scale storage facilities
- **Automated querying** of open-source databases (e.g., OpenStreetMap) to maximize updateability
- **Reviewing literature to approximate** missing data

Due to the **interdisciplinary nature** of the topic, applicants from a variety of fields such as electrical engineering, process engineering, geodesy, physics, data science, or related areas are welcome.

RESEARCH QUESTIONS

- What is the status quo of Europe's hydrogen and biogas infrastructure?
- How can open-source (geospatial) databases be leveraged to accurately map hydrogen and biogas infrastructure across Europe for energy system modeling?
- How can such databases be automatically queried and harmonized to maximize updatability?

SCOPE & METHODS

- Literature review and targeted research.
- Working with the GIS-based QGas tool.
- Automated querying of open-source databases.

BENEFITS for STUDENTS

- Work on an interdisciplinary topic and explore a highly relevant field for decision-making toward decarbonized energy systems!

ORGANIZATION

- 🕒 Start: Immediately
- 💡 Support from the motivated team at the IEE
- 🤝 Close cooperation with supervisor

- 💻 Modern offices available at the institute
- 🏠 Work at the institute & home-office (partially)
- 🗣️ English or German

Contact

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