Contribution ID: **17** Type: **Abstract TEC2ZERO**

Automated and Georeferenced Expansion of District Heating Networks for Cross-Sectoral Energy Planning

The transformation of the heating sector represents a central challenge on the path to climate neutrality. District heating networks play a particularly important role in densely populated urban areas, as they enable the efficient integration of renewable heat sources while supporting the gradual replacement of fossil fuels. The legally mandated, comprehensive municipal heat planning framework provides a binding structure for implementing this transition systematically, data-driven, region-specific manner, based on georeferenced infrastructure data from a geographic information system (QGIS).

Beyond strategic considerations, the technical analysis of existing supply infrastructures is gaining importance. Cross-sectoral energy planning requires the integrated consideration of electricity, gas, and heating networks. This paper focuses on the redevelopment of district heating infrastructure, whose transformation —through the conversion of existing networks, the integration of new consumers, and the expansion into previously unserved areas—necessitates detailed hydraulic and thermal modeling.

These challenges are addressed through the development of a data-driven, automated approach for the conversion, expansion, and assessment of district heating networks. Georeferenced data are transferred into the Python-based simulation environment pandapipes. These are based on real infrastructure information provided by a distribution system operator. The analysis centers on an urban district with high heat demand density, chosen as a representative case since district heating networks are particularly economically and technically viable in such areas.

The planned network expansion is aligned with existing electricity distribution lines and house connections, starting from a suitable peripheral point of the existing network. In addition to the topological design, supply and return lines as well as heat exchangers are dimensioned. The objective is to conduct hydraulic and thermal simulations to evaluate the technical feasibility and efficiency of the planned network. This approach demonstrates, how georeferenced data can be used for automated hydraulic and thermal simulations, providing a solid foundation for further cross-sectoral analyses.

Primary author: Ms BARTON, Nicole (Lehrstuhl für Elektrische Energieversorgungstechnik)

Co-authors: Prof. ZDRALLEK, Markus (Lehrstuhl für Elektrische Energieversorgungstechnik); Mr MAYREGGER, Timo (Lehrstuhl für Elektrische Energieversorgungstechnik)

Track Classification: Future Technologies: Energy Efficiency