

Semester- / Masterarbeit

(Theoretical)

The Impact of Reversible ORC Technology on the Economic Viability and Expansion of Geothermal District Heating Networks

Description:

The expansion of district heating networks is a key component of the heat transition. Deep geothermal energy, in particular, offers great potential for a sustainable heat supply capable of meeting base-load demand. However, a major challenge in the development of geothermal district heating projects is that, at the outset, a sufficiently developed heating network is often not yet in place. This creates a structural imbalance between the available heat supply and actual demand in the early project phases. A large portion of the developed geothermal energy cannot be utilized initially, which significantly impairs the economic viability of the projects.

Innovative technologies such as the reversible Organic Rankine Cycle (revORC) offer a promising solution here. They enable flexible use of geothermal energy: 1) In early project phases, excess heat can be used to generate electricity (ORC operation). 2) As the district heating network grows, the energy is increasingly used for heat supply. 3) In addition, heat pump operation can help cover peak loads. This creates the potential to significantly improve the economic viability of geothermal projects and systematically support network expansion.

The objective of this study is to investigate the extent to which the use of revORC technologies can positively influence the expansion and economic viability of geothermal district heating networks. The analysis is conducted using the PyPSA energy system model (specifically PyPSA-DESOpt-Heat). Both technical and economic aspects are to be taken into account.

Prerequisites:

- Interest in energy systems optimization,
- High motivation and independent, structured way of working.
- Experience in programming with Python (PyPSA) and knowledge of optimization is a plus.

Tasks

- Literature review
- Implementation of multi-investment periods for DHN expansion and the revORC technology into the PyPSA-DESOpt-Heat model

Beginn ab: sofort

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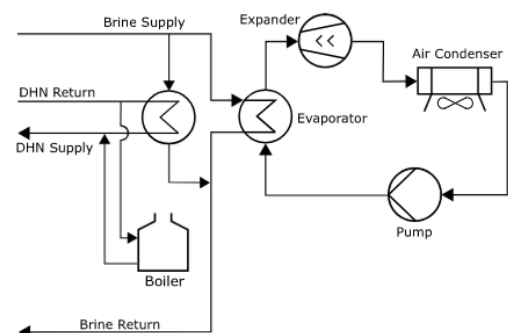


Fig. 1 Plant layout for a reversible ORC integrated into a geothermal CHP plant