

Module 6

Refurbishment of District Heating systems

Part of the SHaKE Educational Package on District Heating and Cooling Systems

Classroom Case Study: Economic Analysis of a District Heating System

Developing institution: BME
Erasmus+ KA220-HED Cooperation Partnerships in Higher Education
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<https://www.shakeproject-dhc.eu/>



Case Title:

Revamping the Heat: Economic Decision-Making in a Mid-Sized City's District Heating Retrofit

Background Scenario:

The city of Energiburg (population: 150,000) operates a 30-year-old district heating network covering 60% of buildings. It currently relies on natural gas and coal. The city council wants to refurbish the system to:

- Improve energy efficiency
- Switch to low-temperature operation
- Integrate renewables and waste heat
- Explore viable business models for public-private financing

Learning Objectives:

- Understand economic drivers in DH planning
- Analyze and compare business models (public, private, PPP)
- Evaluate tariff structures and consumer impacts
- Assess risks, funding sources, and stakeholder perspectives

Part 1: Technical & Economic Overview

Factor	Value
Current energy demand (GWh/year)	600
Supply temperature	110°C
Proposed new supply temperature	60°C
Current fuel mix	70% gas, 30% coal
Proposed fuel mix	40% biomass, 30% industrial waste heat, 30% heat pumps
CAPEX for refurbishment	€85 million
Available grants	€25 million (EU fund)
Potential carbon savings	45,000 tons CO ₂ /year
Heat tariff (current)	€80/MWh (flat rate)

Part 2: Group Questions / Assignments

1. Business Model Evaluation

- Which ownership model should Energiburg adopt (public, private, PPP, cooperative)?
- What are the trade-offs in terms of investment, risk, and control?

2. Tariff Design

- Propose a new tariff structure that encourages energy efficiency and ensures cost recovery.
- Consider motivational tariffs and dynamic pricing options.



3. Financing Strategy

- How should the city cover the €60 million financing gap after grants?
 - Bank loans?
 - Green bonds?
 - Municipal taxes?
 - Heat service fees?

4. Stakeholder Mapping

- Identify key stakeholders (e.g., municipality, utility, citizens, industry).
- What are their likely concerns, incentives, and roles?

5. Sensitivity Analysis

- What happens if:
 - Fuel prices rise?
 - Demand decreases (due to building insulation)?
 - More buildings connect to the network?

Deliverables

- A short presentation or poster on your group's proposal
- A 2–3 page economic summary justifying your business model and tariff plan
- Optional: A role-play debate where different groups represent stakeholder views

Instructor Notes

- Encourage real-world examples (e.g., Copenhagen, Munich, Brno)
- Offer simplified financial spreadsheets to calculate break-even points and payback periods
- Discuss real policy incentives (e.g., EU Green Deal, national subsidies)