# Financial feasibility of heat network projects: a theoretical case study

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# Aim of the financial studies under the Act!onHeat project

- Provide municipalities with information that combines the information on general policy framework, technical aspects of heat network development with the financial side, including profitability and sources of funding.
    - Provide **lists of funding sources** at local, regional, national and European level.
    - Provide further details on instruments under the selected level of funding sources chosen by a municipality.
    - Provide **high-level data on how and when projects are expected to become viable**.
    - **Build capacity at local level** by further explaining the results of technical modelling from the THERMOS software.

# Theoretical case study: profitability and feasibility

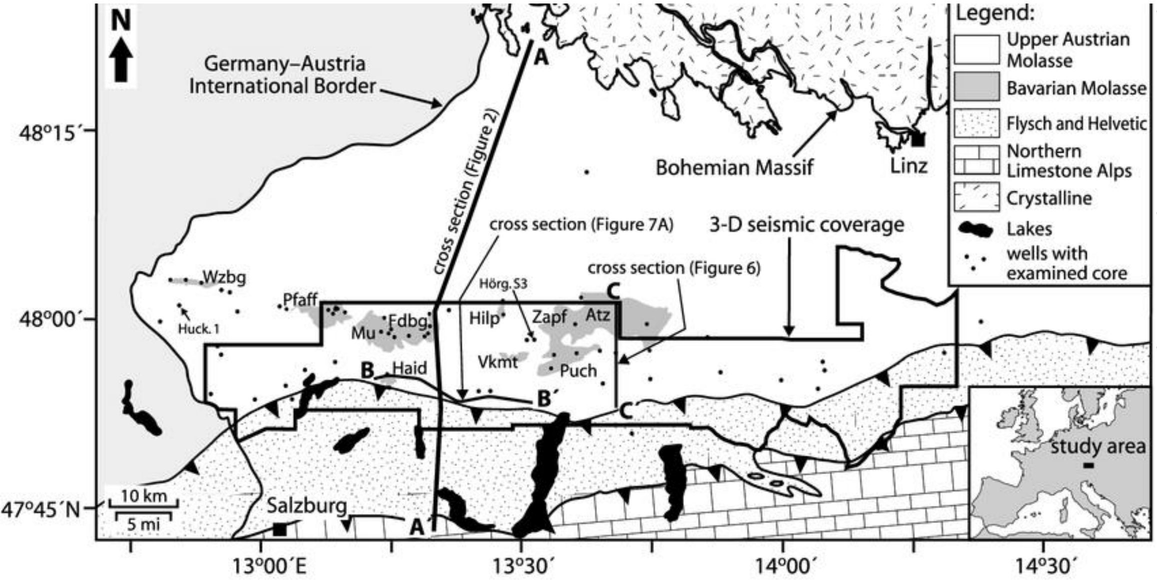
- Understanding what type of project could be financed, and how the initial investments would translate into actual costs and revenues over the first years of the project:
  - Describe **the technical specifications of a project**.
  - Capture **the probable costs based on market trends and local economic scenarios.**
  - Summarise the **expected financial flows** resulting from the implementation of the project.

- **First step** in the actual,  municipality-driven, financial feasibility study for a heat-network project.

# Example: ESG project in Upper Austria (I)

- Austria has recognised the importance of geothermal energy in achieving its climate goals, particularly the target of climate neutrality by 2040.
- Near-surface geothermal energy alone could generate **up to 15 TWh of heat per year by 2040**, while deep geothermal systems could contribute **an additional 9.2 TWh** (Goldbrunner and Goetzl, 2019).
- The Energy Institute of the Johannes Kepler University Linz estimates that the expansion of geothermal energy could **create more than 12,000 new jobs by 2030**, mainly in the areas of drilling, system installation, and maintenance (Energy Innovation Austria, 2021).

# Example: ESG project in Upper Austria (II)

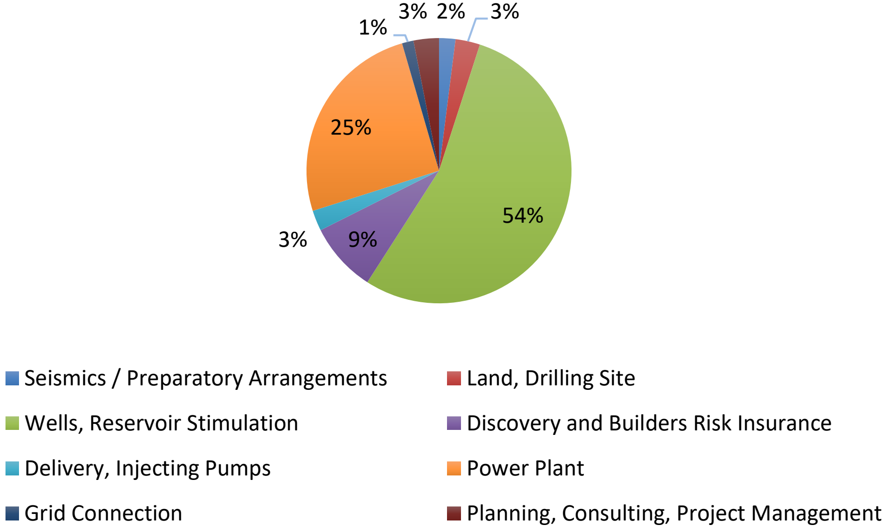


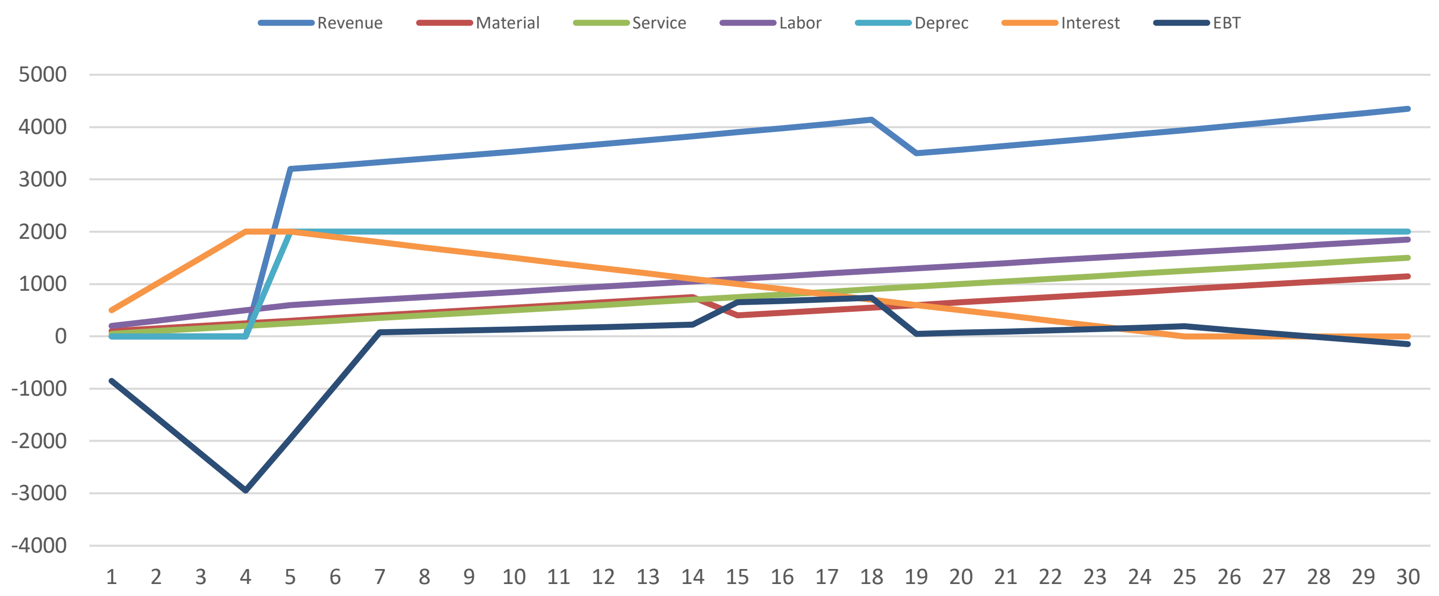

- **The Molasse Basin** is one of the most important areas for geothermal energy development.
- The southern part of the Molasse Basin in Upper Austria remains largely underdeveloped.
- The **Ried-Mehrnbach geothermal plant,** which is currently operational, taps into a geothermal reservoir at depths of more than 2,500 metres.

| | |
|---|---|
| **Location** | Near Ried im Innkreis, Upper Austria |
| **Geothermal gradient in °C/100m** | 3.3 |
| **Flow rate in l/s** | 60 |
| **Delivery temperature in °C** | 165 |
| **Temperature after power plant process in °C** | 60 |
| **Number of wells** | 2 (1 production, 1 injection) |
| **Drilling depth per well in m** | 4,500 |
| **Geothermal nominal capacity in kWth** | 26,250 |
| **Electricity generation nominal capacity in kWel** | 5,000 |
| **Degree of efficiency** | 19% |
| **Power plant type** | Binary (ORC) |
| **Cooling system** | Air-cooled condenser |
| **Parasitic load** | 20% |
| **Net capacity factor** | 90% |
| **Project lifetime in years** | 30 |
| **Reservoir type** | Enhanced Geothermal System (EGS) |
| **Geology** | Molasse Basin |
| **Stimulation method** | Hydraulic stimulation |
| **Expected annual electricity production in MWh** | 39,420 |
| **CO2 emissions avoided per year (tons)** | 17,740 |
| **Number of households powered** | Approximately 11,000 |

- The **annual electricity production** was calculated based on the nominal capacity of the plant (5,000 kWel), the net capacity factor (90%) and the number of operating hours per year (8,760 hours).
- The **CO2 emissions avoided** were calculated based on the expected annual electricity production and the carbon intensity of conventional electricity generation, assuming an average emission factor of 450 grams of CO2 per kWh for fossil fuel-based electricity.
- The **number of households served** was estimated based on the expected annual electricity production and consumption per household in Austria, which is approximately 3,600 kWh.

| Item | Year 1 | Year 2 | Year 3 | Year 4 | Total |
|---|---|---|---|---|---|
| Seismic / preparatory arrangements | 1,200,000 | 0 | 0 | 0 | 1,200,000 |
| Land, drilling site | 0 | 1,800,000 | 0 | 0 | 1,800,000 |
| Wells, reservoir stimulation | 0 | 0 | 32,000,000 | 0 | 32,000,000 |
| Discovery and builders risk insurance | 0 | 0 | 5,000,000 | 0 | 5,000,000 |
| Delivery, injecting pumps | 0 | 0 | 0 | 1,500,000 | 1,500,000 |
| Power plant | 0 | 0 | 0 | 15,000,000 | 15,000,000 |
| Grid connection | 0 | 0 | 0 | 800,000 | 800,000 |
| Planning, consulting, project management | 600,000 | 600,000 | 600,000 | 600,000 | 1,800,000 |
| SUM | 1,200,000 | 2,400,000 | 37,600,000 | 17,900,000 | 59,100,000 |




Revenue
Material
Service
Labor
Deprec
Interest
EBT
5000
4000
3000
2000
1000
0
-1000
-2000
-3000
-4000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

**Earnings Before Tax (EBT) Trends:** EBT is negative in early years due to high initial costs and no revenue but turns positive in Year 7 as revenue surpasses operational costs. EBT peaks between Years 15-18 due to high revenue and reduced costs. In Year 19, EBT declines sharply as feed-in tariffs end, with continued profitability but decreasing EBT due to rising costs and slower revenue growth.

**Revenue Trajectory:** Revenue begins in Year 5 at €3.2M as the geothermal plant starts operating, growing at 2% annually due to the feed-in tariff. This support ends in Year 19, leading to a revenue drop to €3.5M as the project shifts to market prices. Despite the decline, revenue continues to increase at 2% yearly, driven by market price growth.

# Any additional ideas, questions or comments?

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# THANK YOU!

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