Economic efficiency and funding gaps in (LT)DH systems

1   Introduction

1.1   Problem and aim

- (LT)DH projects or in general, projects tackling energy efficiency, need large upfront capital and may lack profitability

- funding can be an option to cover the economic viability gap

- authorities or investors ask for proof of funding gap and its dimension

➔   developing of a calculation method that determines economic efficiency and calculates funding gap as a basis for future financing plans of a project

1.2   Definition of terms

1.2.1   Economic efficiency

- Simply said: when the sum of all benefits is higher than the sum of all costs (over a certain period of time)

- many different calculation methods exist

- dynamic calculations shall be preferred as they consider temporal changes and differences in values of costs and revenues

1.2.2   Funding

- money given by a government or organization for an event or activity

- usually free of charge

- no requirements to pay back it back

1.2.3   Funding gap

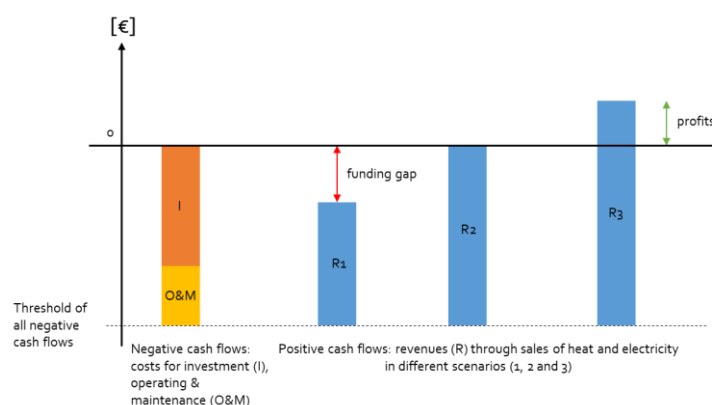- part of the investment that cannot be covered by revenues within the usual amortization period

Fig. 1: principle of funding gaps, positive and negative cash flows, own graphic based on [2 und 3]

- amount of money that can act as a basis when applying for funding

- "difference between the positive and negative cash flows over the lifetime of the investment, discounted to their current value (typically using the cost of capital)" [1, p. (32)]

2 Determining economic efficiency and calculating funding gaps

2.1 Calculation method

- Internal Rate of Return for determining economic efficiency

- Net present value method for calculating funding gap (if investment is not economic efficient)

- Time of consideration: 20 years

2.2 Needed information for calculating [4]

- Input 1: investment

  o investment costs: this includes costs for hardware, manpower, and additional costs

  o discount rate: used for calculating the present value of the investment

- Input 2: costs

  o Costs for fuel or purchased heat: happens by selecting 1-3 heat sources. Depending on which type of heat source is selected, the tool will automatically choose a suitable type of fuel. The user has to define the purchase price of the fuel and its expected cost increase per year.

  o Maintenance: costs per year, either blanket [€] or dependent upon the value of the investment [%], as well as the year from which the costs for maintenance shall be noticed of and the expected cost increase per year.

  o General operating expenses (without fuel costs): include both costs for operating the planned project (incl. electricity, insureance, taxes) and staff costs but no costs for fuel or purchased heat. Either blanket [€] or dependent upon the value of the investment [%].

- Input 3: calculated revenues

  o Mixed price for DH that is sold: by generating and selling heat, the resulting revenues have to be typed into the tool, as well as the annual price increase.

  o Revenue generated by sale of electricity: same as with sold DH heat

- Input 4: heat distribution and other system data

  - Hours of full utilisation of DH system per year

  - average heat losses of DH system (transmission losses)

  - Increase in heat capacity is necessary when heat-generating plants are added to the DH system step by step, gradually, or when buildings (users) are not connected to the grid at the same time.

  - Allocation of distributed heat to generating plants when more than one generating plant is producing heat and its thermal efficiency (if CHP-plants are in use, then the electrical efficiency as well)

2.3   Results

If the project is not economically efficient, the tool will calculate a funding gap which is needed to fund the project that is not currently provided by cash or equity.

investment	157,645.51 €
Internal Rate of Return	1.6%
The planned interest rate will not be achieved.	
amount of investment not covered by discounted annuals results	60,682.53 €

Fig. 2: main results, example, own graphic

3   Conclusion

- Tool is able to determine economic efficiency and, if present, to calculate the funding. Stakeholders can use the tool and its result for applying for funds and are able to show funding authorities or investors the needed amount.

- Transparent method that uses standard calculation methods of business economy and works with MS Excel. No special knowledge of programming or coding is necessary.

- Shown method is based on an AGFW working paper (FW 703) which was developed by AGFW and BTU Cottbus-Senftenberg (both partners of the LowTEMP project) several years ago. Since then, the method had been in use and proven in several applications and assessments.

- Granting money to cover funding gaps can be crucial for implementing not just low-temperature DH projects, but also energy efficient measures that will have an impact on climate protection targets. However, with this tool, no economically consideration of energy saving due to investments in already exisiting systems is possible.

- Results do not imply any approval of funding! Review by funding authority is still necessary.

- Period of consideration is fixed to 20 years.

Sources

[1] European Commission, „Guidelines on State aid for environmental protection and energy 2014-2020 (EEAG)," 2014.

[2] Waqar, H. (2015) Difference between Funding and Financing [Online]. Available at http://www.differencebetween.net/business/difference-between-funding-and-financing/ [Last access on 25th March 2021].

[3] AGFW (2019) *Begrifflichkeiten - Unrentierliche Kosten.* Terminology - unprofitable costs [Online]. Available at https://www.fw703.de/hauptmenue/begrifflichkeiten/ [Last access on 25th March 2021].

[4] Project output, [online] http://www.lowtemp.eu/what-we-do/ Available at Financing Schemes and Business Models [Last access on 25th March 2021].