Assessment of the influence of demographics, refurbishment and climate on the heat demand in district heating planning

7th International Conference on Smart Energy Systems
21–22 September 2021
#SESAAU2021

Abdulraheem Salaymeh
In many cases, district heating networks are modeled using heat demand calculations
- at a certain building energy efficiency standard
- and for a certain climate.

Energy-efficient refurbishments already carried out are mostly neglected due to the lack of information.

Incorrect estimates lead to incorrect dimensioning of the district heating system.
Objectives

- Development of approaches to take into account factors influencing the accuracy of heat demand calculations.

- Investigate the possible impact of incorrect estimation of building heat demand on the profitability of district heating systems.
Changes in the energy reference areas [1]

- Energy reference area projections take into account declining population, increasing housing space per person, and upgrading to energy efficient buildings.
- Increase in the residential building stock in Germany by 2030 and 2050 by 4\% and 7\%, respectively.

![Development of energy reference areas in residential buildings]
Influence of energy refurbishment progress [2; 3]

- Assessment based on a survey of refurbishment rates in the German residential building stock.
  - Refurbishment progress of buildings components (walls, roof/upper floor ceiling, floor/basement ceiling, window)
    \[ F = (f_{Wall} \cdot 0,5) + (f_{Roof} \cdot 0,25) + (f_{Floor} \cdot 0,12) + (f_{Window} \cdot 0,13) \]

- Distribution of the component proportions in the total building area takes into account their influence on the heat demand.

- New, modified area-specific heat demand values can be assigned to each building.
Influence of climate [4]

- Area-specific heat demand values refer to the "Reference Climate Germany".
- Colder or warmer sites can be considered using appropriate climate factors (8233 different sites).
- The heating demand can increase by up to 28 % or decrease by up to 26 %, depending on location.
Due to the decreasing heat demand as a result of building efficiency and climate, the heat generation costs (including distribution and losses) increase significantly.

At heat demands smaller -20 % than expected, the modeled network becomes unprofitable.
Discussion

- The investigated parameters of the energy efficiency in buildings as well as the climate can reduce the calculated heat demand by more than the half.

- The approaches used are generally valid and can be used in further projects. However, the results presented refer to a specific district heating system model.
References


Contact

Abdulraheem Salaymeh

HAWK
University of Applied Sciences and Arts Hildesheim/Holzminden/Göttingen
Rudolf-Diesel-Str. 12
37075 Göttingen
Germany

E-Mail: abdulraheem.salaymeh@hawk.de