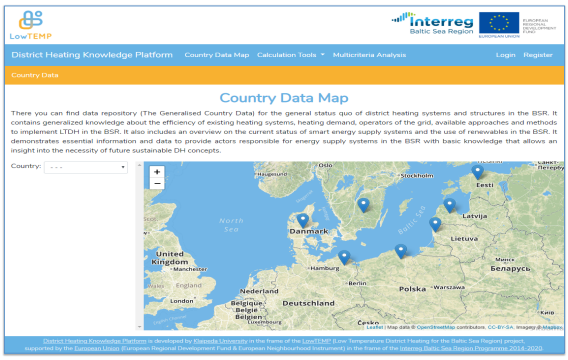
BUP Symposium 2020:
Research and Innovation for a Sustainable Baltic Sea Region

Research on heat transportation efficiency of Low-Temperature District Heating (LTDH) systems

Introduction

Heat transportation in urban areas is a priority for developing regions. New efficient technologies and methodologies are being developed to increase the efficiency and adaptability of current heat transport systems. Optimal heat transport to urban and rural areas has always been a major concern for governmental agencies. Urban heat treatment systems must adopt new energy sources and transport methods, and deal with sustainability problems for rural areas as well. Water heat losses during transportation due to inefficient pipelines and an overall increase in weather temperatures during winter continues to diminish the sustainability of the new energy-saving regulations. In this paper, we demonstrate the importance of the new Heat transport systems according to the new trends to adopt new heat supply technologies for efficient, environmentally friendly and cost-effective community supply - like Low-Temperature District Heating (LTDH).

The aim of this paper is to present an innovative look at the heat transport system from the ICT perspective in accordance with Baltic Sea Region Program project "LowTemp" aimed to evaluate the possibilities of efficient and sustainable heat transport. The authors demonstrate the relative factors and demonstrate developed IT tools (see Figure 1).



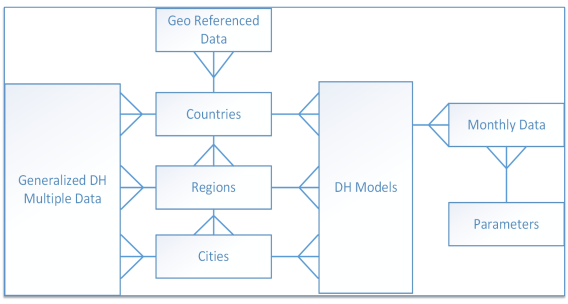
Method

The data collection methodology and consequential knowledge platform will be a tool to be dis-seminated and used beyond the project`s lifetime. It will be foreseen the development of train-ing material to better explain the concept of the methodology and its application.
District heating data have different standards and levels of quality in the BSR partner countries. The selected key indicators and relevant information stored in database will have both qualita-tive and quantitative aspects of the district heating, making possible the evaluation and compa-rability of data on DH/LTDH in different BSR conditions. The data collection methodology implemented within the knowledge platform will also repre-sents a supporting instrument for the finalization of the pilot energy strategies

Development

The general structure of database is shown in figure 2. The general information about countries, regions and cities are stored in appropriate tables, and these tables are associated to "General-ized DH Multiple Data" and "DH Models" tables. The "Generalized DH Multiple Data" table is used to store numbers, texts, links and other unstructured data related to Country, Region and City specific DH information. The user from these database tables will be provided with the most relevant information about the country or region of his interest.

Each country has associated ge-ographical data (like latitudes and longitudes of relevant places of the country) which is stored into "Geo Referenced Data" table. To store the country region and city related heat load models and the results of multi-criteria analysis for potential development of LTDH strategy the "DH Models" data table is used. Each DH model is associated to monthly information (see Annex 3) where indicators are stored into "Monthly Data" table and the list and description of parameters are stored into "Parameters" table.



Keywords

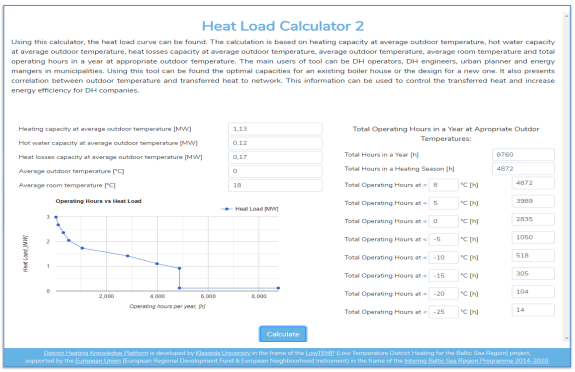
heat transfer, low temperature, district heating, technologies

Main results

The set of indicators is created for investigation of the development of LTDH as the result of the second step of the methodology. Some of the non-quantitative information is converted into measurable parameters. Then the experts evaluate reached results with the aim to identify if the represented set of indicators is appropriate for solving research problem. If no, then there is a need to improve the set of indicators.

If yes, then the set of indicators are further processed with help of a mathematical tool to obtain results. The end results are in additional evaluated, and if the results are not acceptable the set of indicators is improved.

Indicator include:
- Technical indicators;
- Economical indicators;
- Environmental and climate indicators;
- Institutional-political indicators;
- Social indicators.



Main conclusion

Optimal heat transfer to urban and rural areas has always been a major concern for governmental agencies worldwide. Taking into consideration the heat losses due to harsh weather conditions in northern countries, search for optimal technology prevailed in guidelines of EU development strategy. Urban heat treatment systems must adopt renewable energy sources and methods, and deal with sustainability problems for rural areas. Water heat losses due to inefficient pipelines and drastical increase in weather temperatures during winter, led to diminished level of sustainability of the new Energy saving regulations.

For DH system modernization towards the transition to a low-temperature DH and integration of renewable energy sources or other solutions the economic feasibility analysis should be done. From one side there is a need for capital investment but from the other side DH companies obtain financial benefit from savings of consumed resources. Capital investments depend on the installed technology. Authors demonstrate the factors relative to achieving the goal and demonstrate the developed IT tools to do so.

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