OPPONENT'S REPORT

Dissertation thesis

Thesis theme:


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The subject of the report is written work to the doctoral defence dealing with the analysis of the use of exhaust heat from thermal power plants for household needs. The possibility of using heat is carrying out to the Libya in three major urban areas - Tripoli, Benghazi and Sabha. The aim of the study was to determine the value of heat consumption for domestic consumers based on their energy performance.

1. General assessment of this thesis importance

Effective use of primary sources for the population supply is, at present, one of the main tasks of the energy systems of each country, even if it is available, in a sufficient amount, number of primary sources, as is it in the case in Libya. A prerequisite to draw the right conclusions and subsequent measures is the accurate implementation of energy balances and estimating their future development. Analysis of the balance sheet is therefore the basis for the assessment of systemic measures in order to achieve maximum efficiency in the use of primary sources. Therefore, these analyzes were beneficial, allowing the system to take arrangements to achieve the desired effect system and basis for allowing their management.

2. Set goals dissertation

The aim of the dissertation, presented in chapter 6, is the analysis of power heat supply system in Libya and major curations. Further analysis of the individual components of the energy transformation chain primary sources in Libya is made. A sensitivity analysis was to be made to found the influence of heat consumption of households on their location in different geographic coordinates, respecting the same consumption conditions, i.e. under the same heat loss in buildings consumption.
As typical elements of heat consumption were determined three types of residential buildings with a different surface area in these categories:

- 120 – 150 m²
- 180 – 220 m²
- 250 – 300 m².

3. **Methodology chosen to achieve the objectives of the work**

Methodology for achieving is not exactly specified in the work, but can be determined on the basis of logical architecture of each chapter. From the authors presented methodology for the objectives achieving of the dissertation is the important analysis of the energy consumption of households and its future development. The current level determining of energy chains efficiency and the expected target under different scenarios of consumption development is not investigated. Also there is not included, in the methodology, efficiency changes testing, if the heat consumption was covered by exhaust heat from power plants, or provided by local heat sources. Otherwise, the methodology based on an analysis of each subsystem energy transformation chain can be considered correct, as would be expected from the introduction to the objectives set work.

4. **Composition of work**

The thesis is clearly divided into 13 chapters, of which the first five chapters are devoted physical description of the power systems work.

The first chapter deals with the evaluation of basic benefits when a combination of "production" of electricity and heat is used, which is able to utilize the heat dissipation of thermal power plants.

The second one presents a general transformation scheme of primary sources to the final ones, i.e. usable forms, and their parameters in a global scale.

The third chapter classifies the various primary sources entering into the transformation chain.

The fourth chapter is an analysis of power system in Libya and its parameters determination. A characteristic feature of this system is that it operates on the large area, with a relatively small population density, mainly concentrated in coastal areas. At the same time, 75% of the energy consumption is represented by the household sector.

The fifth chapter sets the parameters of the electricity system in Libya for three projected scenarios of the consumption development to 2025.

The sixth chapter sets out the objectives of the dissertation.

Chapter seven summarizes the different types of power plants and their effectiveness.

The eighth chapter discusses the benefits of co-generation "production" using the various technologies. At the same time, the author is defining the technical, operational and economic parameters of these systems.

Chapter nine deals with the determination of the combined "production" of electricity, heat and cold parameters. The most important parameter is the ratio of the comparison between "production" of electricity and exhaust heat usable for consumption of heat and cold. The other, presented indicators, such as Energy Efficiency Ratio (EER), however, are only unit conversions this parameter. This section compares the current parameters of the classical method of power supply securing composed by electricity from the electricity grid, independent heating and air conditioning provided by means of independent units which transform electricity, against a cogeneration unit with absorption cooling use.

Chapter ten deals with the performance characteristics of electricity and heat distribution networks and their power losses calculation.
Chapter eleven - a pivotal chapter, calculates consumption of electricity and heat for domestic purposes for different urban locations in Libya, according to set targets work.

Chapter 12 performed a sensitivity analysis of the heat consumption of the same objects when consumption location is differing by average year-round outdoor temperature. The heat consumption for heating is determined by day-degree method.

5. **The goals achieving set out in the dissertation, theoretical and practical contribution of dissertation.**

From the presented results can be concluded that the thesis objectives were achieved, i.e. measuring and analyzing the energy consumption of households in urban areas, where it would be possible to use the cogeneration technologies operation. The actual comparison of different options, to ensure power supply, is not carried out, which would certainly contribute to the level of verification of analytical results raise. The use methodology has led to real results that are useful for the subsequent use of cogeneration technologies. This too, I see as one of the main practical benefits of the work, under the limited availability of the objective data. Ph.D. student has demonstrated a good knowledge in the field of energy assessment and management of energy systems, and even their ability to practical applications.

6. **Formal level of the work and comments**

Work is processed on a good graphic level. The processing of the work is rigorous and it is seen substantial amount of work that had been done by Ph.D. student in order to prove the validity of the proposed methodology and the methods of the solution suitability.

As the works shortage is to be noted that not always is kept a uniform style of units when the data are presented, i.e. distinction between English and Czech form of numbers labeling.

7. **Statement about the publications of Ph.D student**

During processing of the Ph.D dissertation, he published the results of his work at conferences and in journals. His publishing activities are adequate.

*I recommend the work for defence*

[Signature]

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Pilsen 04. 09. 2014