

Economic analysis of the renovation of small-scale district heating systems—4 Lithuanian case studies

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Received 11 January 2006; accepted 14 September 2006

Available online 13 November 2006

Abstract

This paper describes the renovation and replacement problems of small district heating systems (DHS), which are characteristic to small towns in Lithuania and other Central and East European (CEE) countries. These problems have been scarcely investigated till present and are still the subject of acute energy policy discussions.

The focus of this paper is economic analysis of heat generation costs with the aim to get an answer to the question: whether existing small DHS should be renovated or replaced by individual heating systems. The paper gives an economic analysis of heat generating costs for various technological solutions and capacities suitable for the needs of heat consumers in small towns. The analysis includes long-run heat generating costs in natural gas and biofuel boiler houses and CHP installations, including individual buildings and small DHS.

Four small towns in Lithuania with the population below 40,000 were selected for the economic analysis. The economic, financial and technical state of DHS operated in these towns is different and reflects the diversity of DHS in Lithuania. The least cost heat-generating solutions for individual and district heating were investigated. The barriers for market penetration of new technologies were disclosed under Lithuania's conditions. The findings can also be useful for other CEE countries with similar problems.

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Keywords: DH renovation; Cost analysis; Technological solutions

1. Introduction

District heating based on CHP is an important factor for sustainable energy development. It is an efficient way to reduce greenhouse emissions. However, maintaining such systems is a multi-sided problem and its solution depends on the economic situation in a specific country, existing heat-generating sources, and the state of the heat supply and distribution pipelines in a particular DHS, fuel prices and many other factors. The guidelines for revitalizing district heating and cogeneration in Central and Eastern Europe were elaborated at a WEC symposium that are known as the “Neptune Declaration” (WEC, 2002). This declaration expresses the common opinion of symposium

participants on financing issues, regulator functions and the role of municipalities in maintaining DH systems.

With regard to financing, Governments (national, regional and municipal) should:

- encourage foreign investments in granting national or most-favoured nation status, without exception, and secure a predictable legislative and regulatory framework;
- encourage third-party financing of DH/CHP investments;
- eliminate old debt, thus enabling a fresh start of the DH/CHP industries;
- compensate for foregone revenues of DH/CHP companies, as a result of applying special heat tariffs for the poor.

The Neptune declaration advises that the regulation functions should be transferred to the municipal level. Municipalities should encourage liberalization of energy

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prices at the local level, focus on long-term plans based on community needs and abstain from operational activities, rather than entrusting the ownership or management of DH/CHP companies to the private sector. Fostering renovation and restructuring of DHS, the liberalization of energy prices and privatization is expected to open paths to the private capital market. The guidelines are urgent for DHS that were established under planned economies, with the economic viability of DHS in CEEC that is still being an issue of serious concern. Addressing barriers for the renovation and restructuring of DHS on the national and regional levels could be one of these processes stimulating measures.

The World Bank performed ESMAP study for large cities of the region with the aim to demonstrate fundamental modernization of DHS and support of competition in the heat market being able to reduce heat supply costs and emissions as well as improve the quality of heat supply services for clients (The World Bank, 2000). DHS in small towns appeared a complicated situation as they have lost significant part of their consumers. Therefore, the issue of further maintaining, renovation or replacement became very urgent. Fast development of new heat generation technologies presents new challenges for DHS in small towns. Lithuania is not an exception among CEE countries in this regard. The National Energy Strategy defines the main guidelines for the energy sector development that includes further maintenance of existing DHS where they are economically based. However, it does not offer justified indicators allowing to judge on the economy of such systems (National Energy Strategy, 2002).

The World Bank Group has selected four small Lithuanian towns to investigate the least cost heat supply options in small towns, considering possibilities of new technologies and environmental benefits in CEE countries. Addressing the heat supplies in small towns, one must choose between renovating the existing DHS or decentralising the heat supply. With regard to this issue this paper covers:

- brief introduction of Lithuania's DHS,
- a summary of present and forecasted energy prices, used in the analysis of heat generation costs,
- analysis of the heat production costs in individual boilers,
- analysis of the heat generation costs in DH boiler houses,
- possibilities to reduce heating costs employing CHP,
- general recommendations and conclusions on the example of Lithuania.

2. Brief introduction of Lithuania's district heating systems

District heating is widely developed in Lithuania compared to other CEE countries. Fast DHS development in Lithuania started in 1960s in parallel with industrial

development under centralized planned economy. Management of DH systems was concentrated in two companies. One of them operated 18 DHS in large towns and supplied heat to 80% of residential area in these towns; the other operated smaller DHS in the remaining municipal towns. Centralized management was changed in 1997 through management decentralization of district heating and transfer of shares of newly established joint stock companies to municipalities. Extensive reorganization of heat sector followed the reform transition from the centrally planned to market economy. Significant share of heat consumers disconnected from DH systems during this period; nevertheless, DH still plays an important role in large and small towns. DHS provide heating to over 60% of residential consumers in large towns. This share in small towns it is 10–20%, but these systems often supply heat to public buildings as well.

An independent energy pricing regulating body was established in 1995 as a non-governmental organization, later transformed to permanently operating institution. Its main task was a consequent removal of cross-subsidies and state support for the deregulated part of the energy sector. Energy strategy, developed in October 1999, envisaged transfer to more liberalized energy market, which is compatible with the EU directives. The Parliament issued Electricity, Gas and Heat Laws, supporting the above strategy.

Besides, Lithuania, most countries in the CEEC region, has adopted targeted family credit scheme for welfare customers. A family or a single resident pay for heating of the dwelling not more than 25% of the difference between their income and 90% of the state supported income level.¹ The rest of the dwelling's heating cost is compensated by the municipality budget. Financing of such subsidies is rather complicated in large cities, because it is performed on the account of other social needs. This problem is even more complicated in small towns where heating costs are typically higher than those of large cities by approximately 20%, while family income is by 20% lower in average.

Most heat-generating equipment in use are obsolete steam and/or hot water boilers from Russia and other countries of the Former Soviet Union (FSU) designed for burning heavy fuel oil or natural gas. The operation of the equipment is satisfactory and the efficiency of boiler houses is 80–89% (LDHA, 2003). This is considered as rather good, considering the age of the installations and the level of automation. However, these systems have high operational and maintenance (O&M) costs. The load factor of heat generating equipment, serving DHS in small towns in Lithuania is typically low. The average measured load factor is approximately 10–15% in most DHS. Furthermore, maximum peak loads do not exceed 50% of the installed generation capacity.

¹The state supported income in Lithuania is 165 LTL (~50€) per month/person.

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