

District heating in communities. A manual for operators.

(summary)



Rivne - 2023

District heating and hot water systems are **an important source of energy in Ukraine**. If we consider district heating (DH) as a tool for improving energy efficiency and environmental friendliness, its potential is hard to overestimate. Modernizing one boiler house and heating networks is much easier than replacing thousands of individual boilers. The development of centralized heating and hot water supply systems in Ukraine occurred during the massive construction years of 1950-1990. Obviously, their networks and facilities are worn out and do not meet both Ukrainian and Western European requirements. Losses in district heating networks can reach 20-30%.

Ukraine's current state control and regulation of gas and heat prices make it impossible to effectively reform the sector, preventing utilities from improving efficiency and reducing losses. Enterprises are often subsidized from the local budget, which is an additional burden for communities. The quality of the services provided does not satisfy consumers, which leads to further debt growth. However, with market-based approaches to energy pricing, district heating can become the cheapest and most reliable source of heating and hot water. However, there are communities that have managed not only to preserve the existing district heating system, but also to implement a set of reforms, making it more stable with fewer losses.

The NGO Ecoclub, with the support of international partners and the Association of Energy Auditors of Ukraine, initiated the development of new approaches to the provision of heat supply services by heat producers. Their main principle is based on the need to expand the list of such services along with the implementation of energy efficiency measures. In the course of the study, we calculated the economic feasibility of providing services for the maintenance of the residential building heating system and came to the **following conclusions**:

- heat supply operators can and should maintain the in-building heating system;
- maintenance of such a system allows heat consumers to significantly save heat energy;
- the cost of such maintenance is much lower than the cost of the saved heat;
- the saved funds can be mutually shared between consumers and heat producers who achieved such savings by maintaining the building heating system;
- implementation of the following energy efficiency measures will significantly save the use of fossil resources and increase the comfort of providing district heating services to consumers;

- further expansion of the list of services provided by district heating operators is the basis for ensuring the economic development of enterprises.

These conclusions are the result of our calculations and research, which were described in the manual for district heating operators. In addition, in the manual, we analyzed the measures that can be implemented in the building as a matter of priority — the installation of an individual heat point (IHP) and balancing of the heating system.

In our opinion, the implementation of such projects, along with the subsequent maintenance of the in-building heating system, is a priority for both district heating operators and consumers. After all, it is incorrect operation, primarily incorrect IHS settings, that causes 90% of the installed equipment in Ukraine to operate with errors or not at all (according to the Association of Energy Auditors of Ukraine).

To make our manual an effective working tool for engineers and specialists of municipal heating companies, we have approached its development from the standpoint of rationality and practicality. For this purpose, we have described the principles of equipment operation and provided step-by-step algorithms for its setup and subsequent maintenance. Special attention was paid to the methodology for calculating the savings potential. In our opinion, this information allows both the heat supply operator and consumers to correctly plan the prospects for implementing energy efficiency projects at a particular facility, in a particular manner.

Using the example of our facility, a residential building in Lutsk at 15 Zadvoretzka Street, we analyzed the data on heat consumption and calculated the potential for energy savings. The calculations confirmed the validity of our conclusions and showed the simultaneous possibility of making a profit for the heat supply company and saving money for consumers.

Achieving such a result in real life requires knowledge and practical skills of utility company employees. That is why this manual focuses on the equipment and components available on the Ukrainian market.

In particular, we describe the four most commonly used controllers and the specifics of their configuration. Their proper operation is the key to efficient system operation. We have also reviewed typical cases of IHP failures and described the algorithm of necessary actions.

Special attention was paid to hydraulic balancing of the system. We reviewed the types of balancing valves and the specifics of their installation and configuration. Uniform distribution of heat throughout the building's risers is the key to avoiding cost overruns due to overheating of individual rooms.

Installing a heat pump in a district heating system is definitely a promising solution. This is especially true for commercial and government buildings with a working hot water system. The payback period for such projects is very short. Instead, the use of heat pumps to provide only a heating system, without hot water heating, has a payback period of more than 10 years.

We have analyzed and calculated three scenarios:

- Scenario 1 — installation of a heat pump for hot water production;
- Scenario 2 — installation of a heat pump for hot water production and partial heating of the heating system;
- Scenario 3 — installation of a heat pump for hot water production and heating of the heating system by at least 50%.

Given the needs of the house, we can conclude that the second scenario is optimal compared to scenarios 1 and 3.

Table 1.
Selected technical and financial characteristics of the scenarios

Scenarios	Scenario 1	Scenario 2	Scenario 3
HP Power, kW	12	20	32
Investments, UAH	780 000	1 260 000	1 980 000
Cost savings, UAH/ year	164 678	231 553	278 231
Simple payback period, years	4,74	5,44	7,12

To make the above steps possible, we have developed two types of contracts. The first is a tool for the heat supply operator — a utility company — to provide services for the maintenance of the in-building heating system while ensuring certain savings for the consumer. The second is an agreement for the implementation of energy efficiency measures in the building heating system, which guarantees the contractor (utility company) profit and the consumer of services — savings.

Examples of contracts are available here:

- <https://ecoclubrivneorg.sharepoint.com/:w:/s/ecoclubrivne.org/ERyJR0jXVHJImUtDn9K172UBkTebKvnP19Kr3wlhrksXMg?e=MBThHx>
- https://ecoclubrivneorg.sharepoint.com/:w:/s/ecoclubrivne.org/EbVMVE8DanZFudSKV2QCNQUBF5e29KsEKcv7pSBqGAKSZw?rttime=XPb_DzLZ20g

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