AP25795323 «Thermal Energy Distribution Management System»
Sc. S. – D.K. Brazhanova

Relevance

With the growing demand for energy-efficient and environmentally friendly solutions in the construction sector, especially in Kazakhstan, the project focuses on the optimal use of surplus and secondary thermal energy. This contributes to reducing losses and increasing the overall efficiency of thermal systems. The integration of renewable energy sources requires the creation of a system that ensures active interaction among heat network participants for sustainable and flexible heat supply.

Abstract

Currently, the construction sector leads in energy consumption, making building energy management a critical global issue. Around 40% of the world's energy is consumed by buildings, generating one-third of greenhouse gas emissions. This highlights the need to address energy use and its impact on climate change. The use of a set of devices containing energy and hydraulic connections and reversible devices for receiving and transferring thermal energy — the so-called digital thermal interface — plays a crucial role. Research shows that implementing energy-efficient standards in building design can reduce energy consumption by 30% or more, thereby reducing greenhouse gas emissions. The use of a digital thermal interface is a key factor in energy management, enabling effective control of heating systems. These steps underscore the importance of innovative approaches to improving energy efficiency in Kazakhstan's construction industry. Therefore, the topic "Thermal Energy Distribution Management System" is highly relevant today.

Project Goal

To develop a thermal energy distribution management system that ensures the redistribution of excess thermal energy obtained from renewable sources, as well as the utilization of secondary low-potential heat, in order to improve the efficiency of heat supply to consumers.

Field of Application

The proposed system enables organizations efficiently using renewable and secondary thermal resources to transfer excess thermal energy to third-party consumers. This solution falls within the field of thermal power engineering and can be applied for heat supply to residential, industrial, and other types of buildings and facilities.

Project Tasks:

1. Define requirements for the thermal energy distribution management system;
2. Develop operational principles for the system, ensuring appropriate parameters and environment;
3. Model the thermal energy distribution system using the HOMER PRO software suite;
4. Evaluate the effectiveness of the developed system.

Date of publication of the material: 01.07.2025