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DESING OF ENERGY EFFICIENT INDOOR CLIMATE SYSTEMS

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The aim of the research is to carry out a complex analysis of heating systems projects of individual houses in Belarus on the basis of different types of fuel. In accordance with the state program of the Republic of Belarus on energy saving for 2016–2020 years, the priority objective is to contain the growth of gross consumption of FER, to increase the use of local fuel and energy resources, including renewable energy sources account for the introduction of modern energy-efficient technologies, energy-saving equipment and instruments and materials. Traditional heating systems are the most popular in the existing modern market of Belarus, which does not fully meet the indicators of environmental friendliness and economic feasibility.

The work deals with the most popular currently available heating systems based on various fuels: based on electric energy; based on natural gas; based on solid fuels; using city heating network; based on a heat pump. For heating an area of 200 m² of an individual residential building with effective thermal insulation, a heat generator with a heat output of approximately 10 kW is required.

A methodology has been developed to assess the efficiency of various heating systems in individual residential buildings, taking into account the environmental impact of the projects. At the first stage, identification of the existing traditional and potential innovative technologies of residential building heating was carried out and technical, organizational, legal, financial and economic, environmental and social groups of factors were taken into account, qualitative and quantitative assessment of the factors is made: fuel and energy demand, presented costs, environmental impact of implementation, residual value of equipment. At the third stage, the risks of using residential heating systems were assessed and a list of risk mitigation measures was developed. According to histogram in relation to energy prices the most risky are natural gas and city heating system; in relation to environmental pollution-hard coal. In general, the least risky is heat pump.

It is clear, that the most effective is use of solid fuel boilers on fire wood and peat briquette while use of solid fuel boilers is not expedient. Quite competitive are heat generators in the form of gas boilers and heat pumps, as well as the city heating system. The developed technique allows to estimate and choose the heating project taking into account total expenses and incomes.

