INDEPENDENT POWER SUPPLY SYSTEM OF A BUILDING
IN THE SECOND CLIMATE ZONE

The article contains a brief description and comparative analysis of the organization and maintenance cost of alternative energy sources for a single-family house in the second climate zone conditions. For this aim, building energy consumption was calculated taking into account different family demography. Equivalent power supply of the building was admitted and on its basis the cost and payback of alternative energy systems were calculated. These energy systems are: solar panels and air-source heat pumps, ground-source probe and ground-source solar collectors, wind turbines, heat pumps. Comparative analysis was carried out using the following parameters: input and output power, device cost, service life, payback, operating costs and system drawbacks. Existing alternative sources of energy for individual dwelling can be divided into two basic groups: providing power supply and accumulating heat energy. Systems payback average time makes up 5 years. But all the systems have one common and essential drawback — they cannot provide independent energy and heat supply «single-handed». A new total energy system layout is presented. The principle of power supply system operation is based on compensation of the shortage of energy produced by another source. In our case solar panels and wind turbines are interchangeable. Calculation of a system generating electricity from solar panels was made in case that panels generate maximum 45 % of nominal output during heating season. The system operating with the help of wind turbine is calculated assuming that average wind velocity during heating season in Moscow region is 5 meters per second. Thermal energy is provided from ground-source heat pumps. Arrangement cost of indirect heating system and hot water supply on the basis of ground-source probe will be 665 000 rubles. Total cost of arrangement of independent power-and-heat supply system for a dwelling having 5 residents makes up 1699,6 thousand rubles. Payback time is 13,4 years. The article can be useful for power load determination and for appropriate system choice, that provides maximum independent energy supply for a single-family house.

Key words: wind turbines, solar panels, heat pump, inverter air conditioner, alternative sources, independent power supply system.

References

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