ENERGY SUPPLY OF COUNTRYSIDE BASED ON GEOTHERMAL DEPOSIT

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The economy of any country is based on the usage of natural conditions and resources that were formed on its territory. The change of climate due to the greenhouse gas emission makes significant losses into economic and business activities of the country [1].

Ukraine has signed and ratified the Kyoto Protocol, allowing an us to be involved in the mechanism of international pollution quotas trading by the «green investments» scheme, in accordance with it received funds must be invest into the real projects pointed at reducing greenhouse gas emission or at adjacent areas. According to the international market quotas for Ukraine accounted for more than 13%, and received funds have been invested in projects of several regions of Ukraine (Crimea, Luhansk, Sumy, Ivano-Frankivsk regions) in 2011 [1].

Economic growth will lead to the increasing the greenhouse gas emission, which gradually exhaust quotas limit, therefore total modernization and increasing of the efficiency, including energy industry, and market quotas in this context are more assistant than restraint.

It's necessary to define the «weakest» places and the most energy-deficit regions, where the problem of energy supply needs immediate actions, for the efficiency's increasing of the energy sector of Ukraine. The solution of this issue is possible by the way of implementation the alternative energy sources at the expense of «green» investments.

The goal of work: to analyze various schemes of the energy supply of Medvedivka village (Crimea) based on the geothermal deposit.

The results of work:

- analyzed the current state of energy supply of Medvedivka village;
- calculated electrical and thermal load of the village;
- defined the basic problems and perspective ways of the solving the issue of energy supply;
- carried out the comparative analysis of different schemes of power supply: the centralized power supply from energy system and the decentralized power supply from power plant based on gas engine or gas turbine using fire gas obtained from the thermal medium, or natural gas;
- examined the following district heating schemes: from boiler on the traditional (natural gas, coal) or renewable (domestic waste, agricultural waste) fuels; using the heat of thermal water from the well and equipment cooling system or the waste-gas heat;
- defined the efficiency, environmental impacts (level of the greenhouse gas emission, noise, vibration, etc.), economy and integration capabilities of different schemes in a unified energy system.

During the analysis were used RETScreen software, HOMER Energy software and materials of the FS of mini geothermal power plant in Medvedivka NAS of Ukraine IRE [2].

Conclusions:

- according to the project thermal load (Q_{tw} = 709 kW) of the village is covered by the heat of thermal water (t_{tw} = +74 ° C), and to cover the peak heat load use gas water heater (Q_{peak} = 52 kW); for electric supply use remade for gas fuel internal combustion engine (Ne = 60 kW);
- according to the calculation nowadays thermal load (heating, hot water supply, ventilation) is 1,155 MW; electric load (domestic consumers, auxiliaries of mini geothermal power plant) is 60 kW;
- found the discrepancy of thermal power of the mini geothermal heat and power plant for the necessary graph of heat load and inefficient usage of the combustible gas in the remade engine, what lead to the overexpenditure of fuel and environmental pollution;
- according to the analysis of different schemes for power supply, in terms of impact on the environment the best performances has gas turbine (total greenhouse gas emissions by 15% oxygen in the exhaust is 8 ppmV), but in case of load reduction to 50% of the rated electrical efficiency decreases and increases fuel consumption, what lead to the increasing of the emissions for three times;
- the most appropriate for efficient power supply is a gas engine, because of its capability to reduce capacity to 50% at constant efficiency, with a modern system of waste heat source gases, cooling system and system of capturing greenhouse gas emissions (total emissions is 15 ppmV);
- to ensure effective heat load is proposed usage of heat geothermal water and utilized heat from the gas engine;
- usage of these schemes will reduce annual consumption of natural gas to 372,79 m^3 (430,2 tons of the equivalent fuel) and greenhouse gas emissions: CO_2 for 12,35%, NO_x for 7,5%.

References:

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