Developing an integrated system of heating and hot water for distributed objects based on the use of renewable energy sources with remote control

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Normal functioning of distributed objects heavily depends on successful resolution of power supply issues, particularly of heating and hot water supply.

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In the huge territory of the Republic of Kazakhstan there are more than 50000 distant objects of agricultural and service companies. The latter will receive additional development incentive when they are included in international regime of «West China-West Europe» highway.

Normal functioning of such distributed objects heavily depends on successful resolution of power supply issues, particularly of heating and hot water supply (HHWS). The main issue on HHWS is related to the scarcity and expensive nature of imported fuel that leads to necessity of enhancing the implementation of the renewable energy sources (RES).

Present development of HHWS systems leads to wide usage of solar energy, wind, and soil heat. There is a lack of information on the usage of hybrid HHWS systems (including with remote control) in distributed objects of the Republic of Kazakhstan.

Presumed energy saving HHWS system for service distributed objects supposes the integration of solar energy with wind energy while soil heat and remote control application allows automation of this system and decrease of expenditures on maintenance of technical staff on low-power factories. Structural scheme of HHWS with remote control is shown in Picture 1.

Picture 1. Structural scheme of HHWS with use of RES with remote control
Basic element of the presumed HHWS system will be heating pump (HP) with concentric heat exchangers developed by the scientists of the Kazakh National Agrarian University. Constructive technological scheme of that HP can be seen in Picture 2. Remote control system will be based on innovative technologies of wireless connection with the use of micro process technique and applied programs package. For reserved power supply HHWS systems will use such things as rechargeable batteries, power generator, and wind installation.

**The research purpose**

To create a complex system of local heating and hot water supply for distributed households and service companies by using the renewable power sources with remote control.
Research objectives:

- to search the patents and make comparative analysis of innovative technologies on the RES usage for HHWS systems;
- to develop several options of constructive technological scheme of HHWS system on the basis of RES use for distributed objects taking into account different climate conditions of the Republic of Kazakhstan, and
- to create a complex system of HHWS with the remote control on the university exercise area.

Novelty of development

The constructive technological scheme of heating pump with concentric heat exchangers is developed. This allows the usage of low-potential heat source, which is the helios installations. The cost of such heating pump is two times cheaper than the price of existing ones.

Science practical bases of creation of the HHWS system on the base of using RES with remote control for distributed objects taking into account climate conditions of the Republic of Kazakhstan will be developed. Obtaining of innovative patents and remote control applied programs package is expected.

THE prototype of HHWS system with remote control will be created in the university’s study area as well. It will be used for preparing of bachelors, masters, and PhD students along with providing an opportunity for specialist training.

Innovative attractiveness will be ensured through the usage of modern equipment, new technologies, and constructive technological schemes.