

PROJECT

Study and Demonstration of Autonomous Renewable Energy Sources Based Energy Supply Systems Efficiency in the Eastern Ukraine

The Project Participants

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The Project Objectives

At present, the principal question that both ordinary consumers and professional power engineers ask about renewable energy sources concerns expediency of their application in Ukraine. Is an autonomous renewable energy sources based energy supply system really an adequate, affordable, and economical solution? The state-of-the-art level of alternative technologies development and European experience of their wide application allow answering this question positively. Yet, it is only theoretical.

Lack of efficient state support results in consumers bearing all expenses of alternative energy supply system design and development. That is why alternative systems must be designed to provide maximum efficiency under minimum cost and pay-back period. Due to lack of noticeable practical experience in renewable energy supply systems development in Ukraine, energy managers have to be guided by only theoretical knowledge and foreign manufacturers' recommendations. The latter, however, are practically not adapted to peculiarities of climate in Ukraine, way of its inhabitant's life and economic conditions. It results in designing errors and raising of barriers to wide application of renewable energy technologies.

The objective of the project is research into efficiency of state-of-the-art renewable energy application, adaptation of requirements for autonomous renewable energy supply system designing, and demonstration of capability of up-to-date equipment from the leading European manufacturers in the Eastern Ukraine conditions.

The Research Base

The research base is a Demonstration-and-Education Center “Energoostrov” (“Energy Island”) established by Burenergo Ltd Co., a Ukrainian company engaged in designing and installation of autonomous renewable energy sources based energy supply systems.

The main goals of the Center are

- promotion of new approaches to energy consumption in private life and in business;

- demonstration of capability and promotion of affordable heat and electricity supply systems utilizing wind, solar, and earth energy;
- training of young specialists and post-professional advanced training;
- provision of a research base for investigations in the field of energy-saving and renewable energy sources.

Since 2010 the Center has been actively cooperating with National Technical University “Kharkov Polytechnic Institute”.

The Center “Energoostrov” is located within a 15 minutes’ drive from Kharkov. The Center is a completely autonomous complex with independent electricity, gas, and heat supply comprising an office-and-production building and a number of ancillary engineering structures.

The Center territory of 500 sq m locates a wind turbine, photovoltaic installation, heat pumps, solar collectors, as well as heating facilities, recuperative heaters, and indoor and outdoor lighting facilities of different LED types. The equipment is installed along with corresponding automated control systems with allowance for energy generation and consumption. The Center is equipped with a weather station and a “Smart Building” automated centralized energy consumption control system.

The Center is unique in Ukraine and has hosted a great number of public and professional actions since 2010, including

- training of design engineers and installers on the state-of-the-art power equipment from the leading European manufacturers;
- excursions for scholars, university students, and local authorities from Kharkov region towns;
- a field stage of an all-Ukrainian contest on energy management;
- a plenary session of “Energy Saving and Efficiency” section of an international conference MICROCAD.

Since 2011 the Center has been providing a base to students of National Technical University “Kharkov Polytechnic Institute” for research practice. Master of Energy Management students conduct scientific experiments and do their graduation theses there.

The Project Tasks

The following investigations are planned to conduct under the project:

- analysis of flat and vacuum solar collectors application efficiency for whole-year hot water supply under various weather conditions;
- analysis of whole-year photovoltaic power generation efficiency for different PV panel angles;
- analysis of a vertical-primary-loop heat pump system application efficiency for common heating, air-conditioning, and hot tap water supply;
- analysis of an outdoor photovoltaic LED lighting system efficiency and the system parameter optimization;
- analysis of self-contained low-power wind turbine based energy supply efficiency and parameter optimization of the wind plant accumulation system;
- analysis of conventional and renewable energy sources combination efficiency for power supply systems with various renewable sources utilization;

- analysis of different-type energy storage application feasibility for autonomous power supply systems;
- analysis of “Smart Building”-based control feasibility for self-contained power supply systems.

During the research, renewable energy sources features will be taken into account, power plants capacity ratings will be analyzed, specificity of the local geographic and climatic conditions will be revealed.

Expected Results

Results obtained in the course of the project will allow:

- better understanding peculiarities of different renewable energy technologies application in the Eastern Ukraine;
- demonstrating advantages of renewable energy equipment from the leading European manufacturers of autonomous power supply systems for various scenarios of its application in Ukraine;
- learning designing of efficient and affordable renewable energy sources based heat and electricity supply systems with different levels of autonomy.