ABSTRACTS

Complex Problems of Power Systems Based on Renewable Energy Sources

ZAPOROZHETS Yu. (Kyiv). **Sustainable Development Strategy: ways of overcoming the global contradiction "energy-economy-environment" and scenarios for Ukraine.**

From a standpoint of estimations, requirements and objectives that define the global Strategy of sustainable development, the role of major factors of negative anthropogenic impact on human environment and climate of the planet has been analyzed; the indissoluble link of controversial issues of modern society development in the field of energy, economics and environment is revealed and the concept of integrated approach to overcome the global contradiction between the needs for continual increase of energy capacity and endurance of natural ecosystem to these factors has been advanced. There have been defined the most effective directions of neutralization and prevention of pernicious consequences of consumption and production disbalance in the development processes of industrial states and specified technologies that can ensure the achievement of Strategy objectives, and prognostic assessment of their effectiveness has been executed.

The paper shows possible applications of those facilities and activities that are focused on solving the tasks set by the Strategy for sustainable development in the conditions of Ukraine.

CHUMAK V., TYMOSHCHUK O., MONAKHOV E. (Kyiv). **Field-circuit model of axial flux permanent magnet generator for stand-alone power plants.**

This paper deals with field-circuit model of axial flux permanent magnet generator of small power scale with one-sided magnetic system, which allows getting external characteristics for active and active-inductive load, power factor is 1 and 0,909 respectively. Field-circuit models allow considering dynamic performances and allow analyzing the work of non-standard designs of electric machines. Such combined model gives ability of optimization proposed construction during design for specified range and nature of the load.

Solar Energy

GAEVSKY A., USHKALENKO O. (Kyiv). **The calculation method worked out on energy balance base of an autonomous PV power plant.**

The major problem in autonomous solar plant designing is the sizing of PV system components. In this paper the method of PV plant calculation based on energy balance equations for mean values of daily insolation, energy consumption and cumulative battery energy has been developed. The basic schemes of power flows between PV modules, loading and storage system have been taken into account. The required batteries capacity and the PV modules number are calculated on the base of insolation and loading profiles. This procedure is more accurate than the conventional method of "worst month"or "worst days" which ignores the balance equation for the whole working period. Our method can be applied to any period or autonomous mode of PV plant working.

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KHAIRNASOV S. (Kyiv). **State of the art for heat pipes usage in solar thermal and combined collectors.**

Today the widespread application of cooling systems based on heat pipes makes significant contribution to the solution of thermal control over electronic equipment. The use of heat pipes as heat transfer devices and heat exchanging equipment allows creating an efficient solar energy equipment of new generation. Heat pipes can be widely used to improve the outdated equipment (improving its efficiency, reliability and life time), as well as to create new high-quality technologies. Today there exist the following areas where heat pipes are widely used: flat plate solar, evacuated and thermosiphon solar collectors, as well PV-thermal modules. The article provides the analysis of the current state of the art for heat pipes used in solar energy systems.

Wind Energy

KUZNETSOV M. (Kyiv). **Wind power influence over wind power grid stability.**

The reliability of the power system depends on the compliance of electricity production and consumption. The balance of power in the power system is in a state of constant small random changes. The availability of wind power stations with their inherent variability can affect the stability of the grid. Determining the factors of such influence will help to coordinate the ongoing work with the state power grid.

GOLOVKO V., KOKHANEVYCH V., SHYKHAILOV M. (Kyiv). **Rotor orientation system analysis of a low capacity wind turbine.**

There have been analyzed rotor orientation systems for low capacity wind turbines. The characteristics and the parameters allowing energy losses estimation depending on the orientation system have been defined.

PERMINOV Yu., KOKHANEVYCH V., BUDYONNYI I, DONETS A. (Kyiv). **The algorithm for calculating synchronous generators excited by permanent magnets for wind turbines.**

The algorithm for calculating cylindrical design synchronous generator with a radial magnetic system based on permanent magnets has been developed. The algorithm testing on 200 W generator has been performed.

Hydroenergy

PAZYCH S. (Kyiv). **Technical parameters' evaluation of a marine hydropower storage plant for renewable energy utilization.**

There have been considered the concrete option to create hydro pumped storage plant in the sea and the technical capabilities of its construction based on the experience of world analogues.

Geothermal Energy

KUDELYA P., DUBOVSKYY S., TVERDOKHLIB O. (Kyiv). **Thermodynamic characteristics of heat transformation process in heat pumps driven by heat.**

The research of thermodynamic principle of a heat pump (HP) with heat sets in this paper is based on a fundamental level of the Second thermodynamic law. HP performance is

considered in 2 different schemes: a unifying and divisive one. There has been found connection and difference between such performance indicators as the conversion factor (COP), exergic thermodynamic efficiency coefficient and effectiveness. The effect on irreversible heat transfer and COP has been estimated.

BIOENERGY

SHVOROV S., YURCHENKO O., KOMARCHUK D., OKHRIMENKO P. (Kyiv). **Optimal dosing method for incoming substrates and special additives at biogas power plants.**

There has been offered a method for optimal load planning of input substrates and special additives at biogas power plants (BPP) in order to maximize biogas volume. There have been proposed common recurrence relations of dynamic programming and computational process scheme. They are necessary to find optimal control over loading substrate into BPP in each operation cycle in order to obtain the greatest volume of biogas in restrictions on impurities costs and the time for methane fermentation.

KLYUS V. (Kyiv). **Autothermal technology for bird droppings carbonation.**

There has been developed an autothermal technology to carbonize bird droppings in dense layer mine reactors. The results of processing chicken and quail broods have been presented. Carbon residues resulted from carbonation process are recommended as a fertilizer.

GOLUB N., LELEKO I., KOZLOVETS O. (Kyiv). **Impact of raw material co-fermentation over biogas yield.**

The influence of poultry manure additive substrate on the obtaining biogas from hemp process was reviewed. It is shown that adding the manure to cellulose fiber leads to biogas yield increase 2 times and methane content up to 70%. Pretreatment of the raw material with acid causes decrease in biogas yield rates through medium pH decrease. Addition of Ferrum (II) ions in concentration of 100 mg/dm^3 has a positive impact on biogas yield rates in case of pretreatment of raw materials with acid; in case of raw material treatment with steam Ferrum (II) ions have a negative effect on biogas yield. The hemp processing products such as paper also can be used for biogas obtaining with 51% pure methane content.

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