

Complex Problems of Power Systems Based on Renewable Energy Sources

KUZNETSOV M. (Kyiv). **Modeling power system parameters that are considered stochastic.**

Power system performance has got its own stochastic factors in a definite region or country. Such factors could be variable current energy consumption and natural unstable power plant operation caused by utilizing RES, for instance, wind energy. Mathematical modeling of instability factors allows forecasting power system behavior and ambiguity level. Based on stochastic differential equations these mathematical models ensure quite adequate reflection of random processes and allow working out absolute conclusions regarding wind power plants influence over power system stable performance.

BILA H., ZAPOROZHETS Yu. (Kyiv). **Options to convert threatening disposal tips into processing power complexes on the example of aluminous plant in Mykolaiv.**

The article reveals information as per ecological disaster caused by unrestricted dump/sludge accumulation and storage of harmful industrial wastes on the example for instance of aluminous plant in Mykolaiv.

It has been proved there could be built complex wind and solar power installations on these huge areas covered by dumps. The capacities of those will be enough to process and utilize sludge and similar wastes.

TKALENKO D., KUDRYA S., TKALENKO M., VYSHNEVSKAY., BUD'KO V. (Kyiv). **Transport stages and layout of current generating processes in high temperature fuel cells.**

There has been proved that the layout of cathode oxygen deoxidation over porous gas-diffusion electrodes in hydroxide melts has been considerably different to the one applied for a case with electrolytes' water solutions. In hydroxide melts on "three-phase border" of gas-diffusion electrodes maximum local density of cathode current is installed in meniscus zone. This fact is stipulated by the features of such melts and, in particular, their abilities to absorb oxygen chemically with further peroxide and over-peroxide combinations formation. Due to participation of higher oxygen combinations in cathode process currents with 70 mA/cm² density can occur even on smooth (nonporous) nickel electrodes. This can be used when developing highly efficient electrochemical energy converters.

Solar Energy

BEKIROV E., KHIMICH A. (Simferopol). **Theoretical assessment of cylindrical concentrators' performance efficiency in nontracking solar systems.**

The article describes developing an applied program based on ray tracing for further modeling solar concentrators performance. It also provides program application results in order to compare cylindrical concentrators' efficiency with various cross-sections.

KNYSH L. (Dnipropetrovsk). **Numeric simulation for radiant heat transfer process in solar concentration system named "cylindrical parabolic concentrator – tubular heat receiver".**

There have been presented numeric simulation examples for radiant heat exchange in solar concentration systems of "cylindrical parabolic concentrator – tubular heat receiver" type. Based on a created mathematical model there have been developed a numerical algorithm which in due course is based

on Monte-Carlo method. During a number of experiments aberration influence over mirror power parameters was revealed. There was also defined an optimal shutter angle, the influence of receiver location relatively to focus was analyzed. Numerical and experimental data comparison has shown good correlation.

KOKOSHYN S., KOLOMIETS D., KUCHINSKYI V., SURZHYK A. (Kyiv). **Determining geometrical and thermophysical parameters of a solar collector and a PV module with composite heatsinks.**

With the help of final elements there have been studied the influence of thermophysical and geometrical parameters of a heat-removing panel over a solar collector and a PV module efficiency. The heat-removing panel has been made of composite materials.

GORBATYKH O., MAKAROV V. (Sevastopol). **Solar collectors' efficiency output in three-cascade solar systems for hot water supply.**

There have been considered mathematical models to calculate solar collectors' efficiency with transparent and backside insulation. These collectors make up the third cascade of three-cascade solar HWS system. Also there have been presented a relative error of mathematical models in comparison to test data. Average monthly efficiency for the third cascade has been provided for Sevastopol climatic conditions. A corrected algorithm for the third cascade solar collectors efficiency has been worked out.

Wind Energy

TUCHINSKYI B. (Kyiv). **Average wind speed in windpower.**

The article considers the lawful right to apply widely used average wind speed index in wind power calculations. Using this index to provide wind power potential estimations is proved to be not reasonable. Alternative indexes of average wind speed have been suggested and they are free of average arithmetical wind speed defects.

YAKOVLEV A., ZATUCHNAYA M., PASHKOV V., MERKUSHEV V. (Kharkiv). **Validating sectional blades for wind turbines use, construction and approximation methods.**

The article considers a design method for sectional wind turbine blades and a method to build power curves for WTs with such blades. A comparative analysis of power curves for classic and sectional blades has been made. Also there have been presented profile approximation on dimensionless coordinates.

Hydroenergy

VAS'KO P., VIKHOREV Yu. (Kyiv). **Topical issues of small hydropower development in Ukraine nowadays.**

There have been considered complex features of small hydropower, issues of adjacent lands flood protection and nature conservation, issues of managing control over small HPP design and operation as well as investment terms for future HPP development. There was made a conclusion as per existing need to provide state support for ideology (the matter and the idea) and regulations development; need to substantiate the scheme for small HPP disposition.

Geothermal Energy

MOROZOV Yu. (Kyiv). **Thermal design method for underground heat exchangers and accumulation batteries.**

There have been developed a method of thermal design for heat accumulators and underground heat exchangers in earth upper layers with the help of non-stationary heat transfer coefficient.

BIOENERGY

KLYUS S. (Kyiv). **Identifying straw and agricultural wastes power potential during the period Ukraine has become an independent state.**

There have been presented results of corrected data for straw and agricultural wastes power potential by means of efficient agrarian technologies method. Based on processed data about straw production from various plants the theory about coefficients permanency for agricultural wastes has been disproved. Due to estimations straw and agricultural plants energy potential has increased from 14,3 to 30,0 million tons of standard fuel for the period 1990-2011 years.

MATVEICHUK A. (Kyiv). **About a co-combustion technology for brown coal and straw in combustion chambers with a fixed bed.**

There have been built a mathematical model for

aerodynamic, physic and chemical processes. Due to this model there co-combustion of brown coal and straw in reactors with a fixed bed due to cross-current scheme for layer process has been studied.

BUD'KO M., ZABARNYI G. (Kyiv). **Mathematical heat transfer model from plants oils to recurrent type biodiesel in a trans-esterification reactor.**

There have been suggested a mathematical model for heat transfer in the reactor for plant oils trans-esterification into recurrent type biodiesel. The model is actually a thermal conductivity equation with inner energy sources involved. The way to set inner energy sources intensity during mathematical modeling of heat transfer process in trans-esterification reactor has been shown. The principles to plan real heat transfer process due to the above suggested mathematical model process have been demonstrated.

KORINCHUK D. (Kyiv). **Working out and analyzing a mathematical model to forecast briquettes firmness when pressing composition mixtures that use peat as biding material.**

Current mathematical models to forecast briquettes properties have been analyzed. Factors influencing mechanical firmness of composite briquettes have been substantiated. The mathematical model has been worked out and analyzed.

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