

## ABSTRACTS

### COMPLEX PROBLEMS OF POWER SYSTEMS BASED ON RENEWABLE ENERGY SOURCES

KAZANSKIY S., MYHAILENKO V. (Kyiv). **Simulation of power grid with distributed generation sources.**

The necessity to study power grid with distributed generation sources (DG) has been presented. The power grid model with two sources of DG has been developed and the simulation results have been analyzed.

NESTERKO A. (Kyiv). **Approach to frequency control improvement for a power system based on renewables.**

According to the adopted "Energy Strategy of Ukraine till 2030" the market provides for widespread RES implementation in power grid thus causing the changes in generating capacities structure of United Energy Systems of Ukraine, its frequency and operating conditions mode of existing automatic control systems. Using monitoring system transients' data can solve the problem of optimal controllers' synthesis to control transient modes by electric power system frequency. The paper studies the approaches for using controlled renewables as means to adjust system frequency; offers the structure and hierarchical system algorithms of centralized management for regimes of electric power system frequency.

### SOLAR ENERGY

SURZHUK T. (Kyiv). **Studying polymeric composite absorber for solar collectors.**

The absorber for a solar collector has been made. The absorber is made of polymeric composite material based on carbon fiber with fillers. The required thermal and strength properties of the generated material were achieved by filling the carbon fiber with different fillings, as well as by appropriate manufacture technology.

KOLOMIETS D., KHARCHENKO L., MATYACH S. (Kyiv). **Defining average temperature of photovoltaic panels.**

Using the divergence theorem there has been developed a method for calculating the average photovoltaic cells temperature. As a result of full-scale experimental studies there has been found that the results of the theoretical analysis and experimental data agree qualitatively.

KHAIRNASOV S. (Kyiv). **Heat pipes application in solar energy systems: concentrating solar systems, solar wall, solar cookers.**

Today energy systems based on solar thermal collectors and PV panels contribute to solving energy sources conservation issues. Implementing thermal pipes as heat transfer and heat exchange devices (heat pipes) allowed increasing solar thermal collectors' performance. However, using heat pipes as heat exchangers and heat transfer design elements allows creating new solar power equipment, as well as improving the efficiency of the existing one. Apart solar thermal collectors today there exist equipment and solar power systems where heat pipes can be widely used. Among them photovoltaic

and thermoelectric power system with solar energy concentration, solar walls and solar cookers. The article analyzes state-of-the-art and prospects for heat pipes in such solar power systems.

### WIND ENERGY

GOLOVKO V., KOKHANEVYCH V., SHYKHAILOV M., ZINCHENKO T., SANDOVAL Z. (Kyiv). **Analysis layout of autonomous wind power systems with asynchronous generators.**

There have been analyzed structural schemes of autonomous wind power systems with asynchronous generators. As a result it has been defined that design stage should focus on the schemes that can increase the fill factor of the load curve of the consumer.

PERMINOV Yu., KOKHANEVYCH V., MARCHENKO N. (Kyiv). **Comparing end non-grooving generators for wind turbines with traditional generators.**

There has been made a comparison of some electric and electromagnetic parameters of two synchronous generators' types with permanent magnet excitation, namely in the form of end construction with a non-grooving stator and traditional construction equipped with a grooving stator.

### HYDROENERGY

VASKO P., IBRAGIMOVA M. (Kyiv). **Hydroelectric units' energy efficiency of a small hydropower plant when regulating its capacity by the river watercourse.**

The assessment of hydraulic units' energy efficiency as part of a small hydropower plant has been made. The rational number of units to regulate watercourse capacity has been specified as well as environmental restrictions on the use of water for power generation.

### GEOHERMAL ENERGY

DUBOVSKYY S., TVERDOKHLIB O., KUDELYA P. (Kyiv). **State, prospects and problems of district heating & cooling (DHC).**

Due to global warming concept there have been discussed global trends in practical use of energy-efficient district cooling systems based on combined types of energy production involving renewable energy and secondary used fuels. There has been presented the classification of such systems. On the example of Kiev city future demand in cold for air conditioning facilities has been made estimated. Conceptual options for municipal district heat and cold supply systems have been considered. These options consider possibilities of reducing fuel consumption, greenhouse gas emissions, improving load power equipment, solutions for anti-peak power supply control. There has been determined the relevance of further research of such systems with using improved methods for calculating energy consumption and cost of heat and cold in terms of their combined production.

---

**KRAVCHENKO I. (Kyiv). Prospects for developing hybrid geothermal heat technologies in Ukraine at elaborated oil and gas fields.**

The article deals with the prospects to re-use deep mining oil and gas wells at elaborated hydrocarbon fields. The main task is to create geothermal energy mining and accumulating units without drilling special wells. This will also provide financial savings for these works as they are quite costly.

**SHVETS M. (Kyiv). Experimental research of waste heat amount for a generator cooling system TVV-320, building No.1 at Kyiv HPP-6, which can be used for heat pumps.**

There has been experimentally determined the amount of waste heat for a generator cooling system TVV-320, building No.1 at Kyiv HPP-6. This heat can be used in heat pumps for heat supply. The guidance for heat pumps selection has been issued and fuel savings have been estimated.

### **BIOENERGY**

**ZHOVMIR M. (Kyiv). Duration of volatile release at burning of straw particles and straw pellets.**

Procedure of experimental investigation to determine duration of volatile release period at thermolysis of particles of straw and single straw pellets at oxidizing atmosphere in the muffle furnace is described. The influence of muffle temperature, moisture content, and diameter of pellets were investigated. Thermolysis of straw particle flows 3...5 times faster than that of straw pellets. Dependence of volatile release duration from temperature is exponential in nature. Duration of volatile release period for straw particles and straw pellets rises at moisture content

increase.

**GOLUB N., DRAPOY D. (Kyiv). Hydrogen production from corn and sunflower wastes while enriching natural microorganisms association by Bacillus and Clostridiu families.**

The research studied hydrogen production ability from cellulosic materials in mesophilic anaerobic enzymatic process of natural microorganisms associations emitted from soil and lake. It was proved that hydrogen yield depended on the species composition of microbial associations. Additional simultaneous enriching of natural association by Clostridium and Bacillus significantly reduces the duration of the lag phase and increases hydrogen yield 4 times as compared to the natural association. Under such conditions the hydrogen content in biogas is increased and reaches  $85 \pm 5\%$ .

**ZUBCHENKO L., KUZMINSKYI Ye. (Kyiv). Light-dependent hydrogen production in fuel and biofuel cells.**

The article examines ways of hydrogen production by using solar energy. Brief review describes existing photoelectrochemical systems which perform the electrolysis of water to obtain hydrogen, what is possible without any external biases except solar energy. There have been examined researches on combining bioelectrochemical and photoelectrochemical systems. Photobioelectrochemical systems are almost autonomous and depend only on the availability of nutrients for microbial biofilm and lighting. There have been determined main directions for further research systems.