MODELING AND RESEARCHING OF THE PROCESSES OF CONTROL OF HYBRID POWER SUPPLY SYSTEMS

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This work is devoted to the currently actual problem of electricity, the prospects and shortcomings of energy supply systems. Nowadays, one of the solutions to energy problems is the use of various energy sources. The possibilities of using renewable energy sources and centralized power systems in Uzbekistan and the basis of their use are researched. In work issues of power generation based on hybrid energy sources, modeling process of controls of energy conversion and research based on MATLAB software systems are considered.

Keywords: *electricity, energy, renewable energy, electric power system simulation, the MATLAB software package, conversion factors, chains, indicators and parameters.*

МОДЕЛИРОВАНИЕ И ИССЛЕДОВАНИЯ ПРОЦЕССОВ УПРАВЛЕНИЯ ГИБРИДНЫМИ СИСТЕМАМИ ЭЛЕКТРОСНАБЖЕНИЯ

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Данная работа посвящена актуальной на сегодняшний день проблемы электроснабжения, перспективам развития и недостаткам управления систем энергоснабжения. На сегодняшний день одним из решений проблемы энергоснабжения является использование различных типов источников энергии. В работе рассмотрены возможности совместного использования возобновляемых источников энергии и централизованной электрической системы в Узбекистане и основ их использования. В работе приведены результаты моделирования исследования процесса производства электроэнергии на основе гибридных источников энергии на основе программного комплекса MATLAB.

Ключевые слова*: электроэнергия, источники энергии, возобновляемые источники энергии, системы электроснабжения, моделирование, программный комплекс MATLAB, коэффициенты преобразования, цепи, показатели и параметры.*

Introduction

In the current years the number of world's population is growing year by year, the development of production and household appliances lead to increase significantly the demand for electricity energy. According to relevant reports and analisys of electric energy in the world today, cosumers' demands are growing to 2,5 % in per year. If continous rising the number of population and the demand to electric power, the energy sources on the basis of hydrocarbon can not supply of the world economy with electricity in the next ten years [1, 2].

The evaluation of the amount of hydrocarbon products are known the world economy to ensure oil 54 years, natural gas 64 years and coal to ensure supply will reach 112 years [3]. At present the population of the world full of electric power supply remains a problem as conundrum. 20 % of the world

population does not use electrical energy, 40 % of the population is traditional biomasss has been used as a cenralized power supply [2].

Today the world of renewable energy sources, energy security and the preservation of natural resouces and energy in one of the priorities of the solution of the problem. On the 5-of the may heading 2015 year the president's decision PDN№ 23 43 is adopted reversing rod about reduction of the expenditure of electric power in the social and economical branches, using measures of thrifty energy technologies in 2015–2019.Resolution of 2015–2019 years, the country's social and economical aspects of efficient energy sources introduction of technologies and systems designed to reduce energy consuption for many years set out to determine the best routes [1].

Main part

International experiences as well as conducted in Tashkent region Bostonlik district and Djizzakh region Gallaorol district scientific researches has shown that the production of energy using from renewable energy sources bring many difficulties in weather condition and winter season in the year. In this way to provide with steady energy of telecommunication facilities which the territories are situated far from centralized electric power supply and not delivery electric energy. To use renewable solar, wind, minihydro (GES) and biomass energy sources on the basis of hybridly control.

Why this issues is so climax, in this period always made of work from telecommunication facilities despite weather and season in a year. In this situation demands to use centralized electricity supply systems as wellas renewable energy sources such a hybridly and suppliying of telecommunication facilities with stable electric energy [4]. When we say hybrid power supply systems, understand the combination with the various sources of energy at the same time equip with continuous energy of telecommunication facilities, instructions and charge of batteries.

The building trend and manage analysis of hybrid energy sources. The hybrid power supply system includes a number of sources energy. They are the electricity stations on the base of solar panels (SES), the station on the base of wind generator (WES), the batteries of accumulator (AB), diesel generators (DG) and other type of energy sources change energy and require the constructions of telecommunication with electric energy.

Telecommunications equipment and consumers of electrical energy, hybrid energy sources in parallel with one or more of the adaptive management over a period of several energy sources and consumers of electric energy use taking into account the amount of voltage and phase (Figure 1).

Modern telecommunications' devices to the power supply system of the main energy source the sunlight (or heat) energy into electrical energy on the basis of the physical technical effect. Solar power plant (SES) to light or heat into electrical energy supply. The accuracy of generated electric (S

and T) stabilizer and back connected T_1 thriystors and tries. General machinery to (C) control the current passing through the protection device and a controller and telecommunications equipment for the electric power supply.

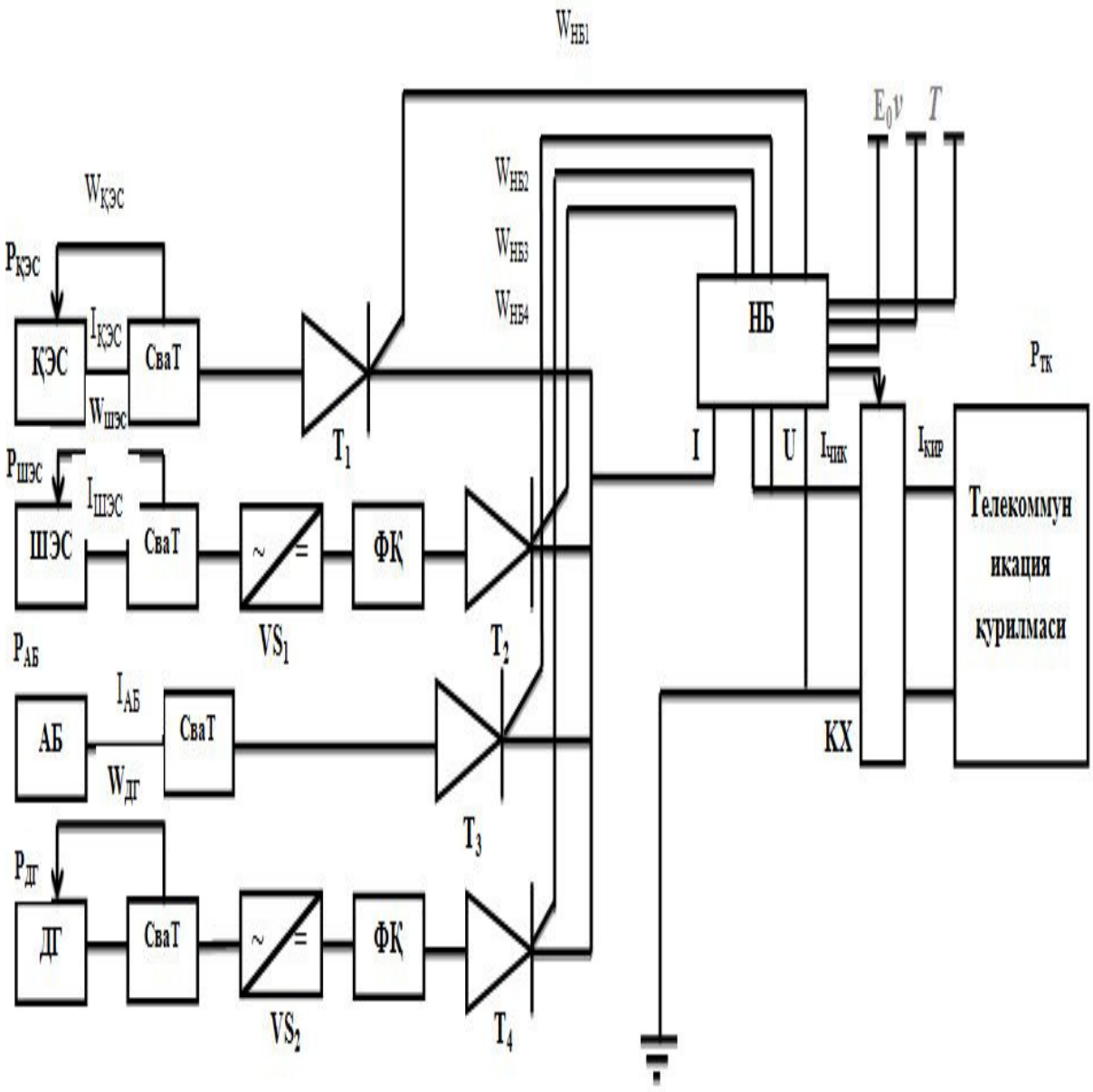

Figure 1. The structure of the hybrid power supply system and structural

Power supply systems energy source, (WEP) wind power plant converts the mechanical energy of the wind power. Electric (S and R) stabilizer and connected through the right VS_1 invertor. Inverts suspension and filtred through (FD) a filtering device connected T_2 thyristors total income tires.

Solar wind power plants produced by the current tire monitoring device, along with the facilities of a telecommunication power supply baterry charger. Weather depending on the status of renewable energy sources cannot provide current telecommunication facilities to produce energy (CD) control devices automatically provides the use of weak (AB) batteries. If the (AB) batteries of renewable energy sources and electric consumers who are

unable to provide the electric power (CD) control unit depending on the load of diesel to run the generator. Diesel generator (DG) converts mechanical energy ento electricity. Electric (S and R) stabilizer and the right back of inverters, inverts current (FD_2) filtering devices are filtred through the thyristors is connected to the public electricity supply tries. Thus, managed hybrid energy sources provides contiunity of elecrical energy consuption. The effective implementation of the hybrid energy sources into a powerful to changable used for reducing the voltage inverter and a booster. This hybrid energy sources and management structure of the optimal mathematic model of the process to change the basis for the constructionof energy sequence reseach on the basis of this model requres the creation and application of reseach results into practice.

Changes in light and heat into electricity with the help of the solarcells are two types of mathematical models with the following process.

SES-solar energy stations, WES-wind energy stations, AB –accumulator batteries, DG-diesel generator , S and R- stabilizier and right,VS_1- VS_2- inverters, FD- filtering devices, CB- control block, I-the current passing through tire to control device, U- voltage out of the control tires, I_{exit} - current strength out of the control tires, I_{entry} – current strength input of telecommunication devices, E_o- the sensor to measure of solar insolation, ν - the sensor to measure speed of wind, T - the sensor to measure of temperature, C and S- controller and security, T_1- T_4 - thyristors, W_{ses} - produced by the solar power station is managed through the vines S and R_1 feedback function, W_{wes} - wind power station producing vines S and T_2 administered through the feedback function, W_{DG} - diesel generator producing vines S and T_4 administered through the feedback function, I_{ses} - the current produced by solar power station, I_{wes} – the cyrrent produced by wind power station, I_{ab} – the battery vine, I_{DG} - produced by the diesel generator outlet, W_{CB1} – W_{CB2} - feedback signals.

1. Light energy into on electrical voltage and electrical current system to create a model based on technical effect (the effect of Stoletov).

- light energy into optical and electrical nature of various size and parametres of different nature parametes circuits into a voltage coefficient is based on the technical physic effect (Fig. 2).

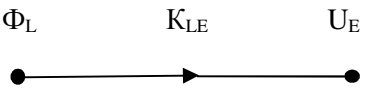

Figure 2. The Graph's model turn into the voltage of the light.
Here: Φ_L – light flow, U_E – electrical voltage
K_{LE} – the rate of the chain of optical and electrical interaction of nature

The light energy of the physical and technical effects (effect Stoletov) K_{LE} on the basis of an optical magnitude or size parameter or parameters into voltage electricity through the conversion rate between large chain. The flow

of light into electric voltage graph created a mathematical model based on the model:

$$U_E = K_{LE}\, \Phi_L \qquad (1)$$

The flow of light into electric voltage and vine physical and technical effects (Stoletov effect) to create a graphic model (Fig. 3). Light into the flow of electrical current is carried out as follows: the light is converted to voltage electricity through the flow rate of between large chain, P_E electric chain electrical parameters (conductivity) of electric chain sets (resistance) on the basis of an electric current is converted.

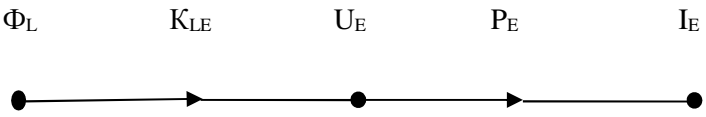

Figure 3. Light energy into electric current rotation scheme.
Here: Φ_L – light flow, U_E – electrical voltage, I_E – electric shock
P_E – coefficient voltage power converter
K_{LE} – the rate of the chain of optical and electrical interaction of nature

Light into the flow of electrical current created a mathematical model based on the graph model:

$$I_E = P_E\, U_E = K_{LE}\, \Phi_L\, P_E \qquad (2)$$

2. Heat flow into an electrical voltage and supply the physical and technical effects (Zeebek effect) based graphics model (Fig. 4).

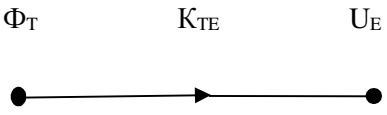

Figure 4. Graphical model heat flow into electrical voltage.
Here: Φ_m – heat flow, U_E – electrical voltage,
K_{TE} – thermodynamic and electrical nature of mutual communication chain ratio.

The flow of heat into electrical voltage created a mathematical model based on the graph model:

$$U_E = \Phi_T\, K_{TE} \qquad (3)$$

The rate of heat flow between large chain and then converted to an electrical voltage is converted to electric shock via the P_E electric chain.

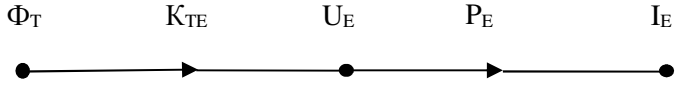

Figure 5. A graphical model of heat into the flow of electric current.
Here: Φ_T – heat flow, U_E – electrical voltage,
I_E – electric shock, P_E – coefficient voltage power converter
K_{TE} – the size and nature of the thermodynamic parameters, the rate of mutual between large chain

Heat into the flow of electrical current created a mathematical model based on the graph model:

$$I_E = P_E U_E = P_E K_{TE} \Phi_T \quad (4)$$

Figure 6 MATLAB integrated complex energy sources using the selected blocks in size, current, voltage, magnetic research model for the study of the flow. The mathematical model of energy sources, taking into account the quality of the management of transient processes classification study of electric and magnetic magnitudes measuring in real time.

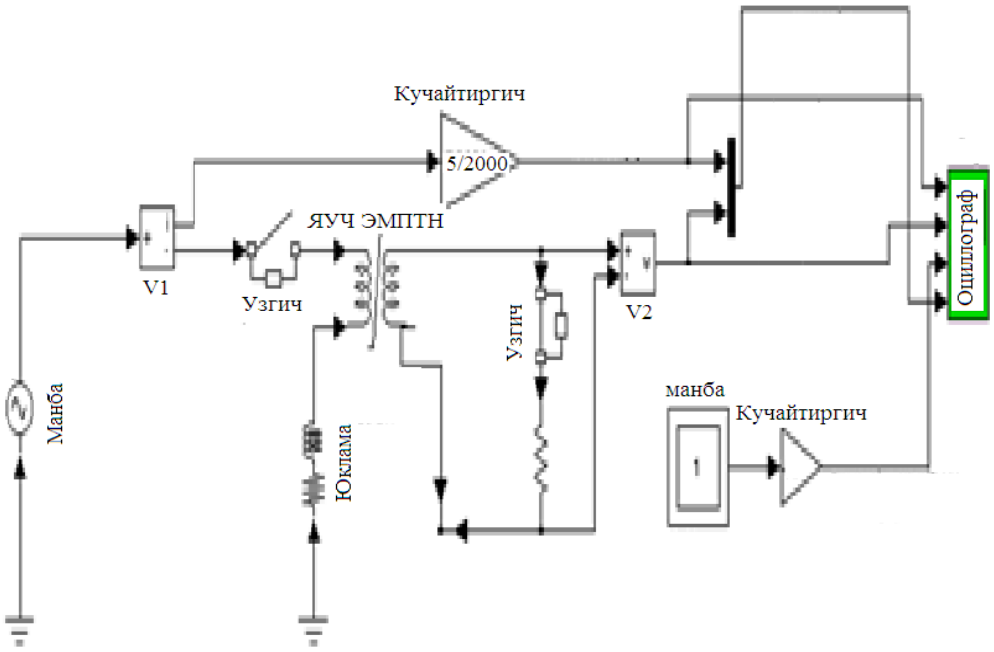

Figure 6. MATLAB software based on a complex power supply management research model

Fig. 7 in MATLAB programs based on complex energy sources, the results of basic research in virtual magnitude.

We can conclude the results of a study of the model of energy management manbalarinig created a mathematical model of energy supply system allows the study of the magnitude and value of the real time [5–8].

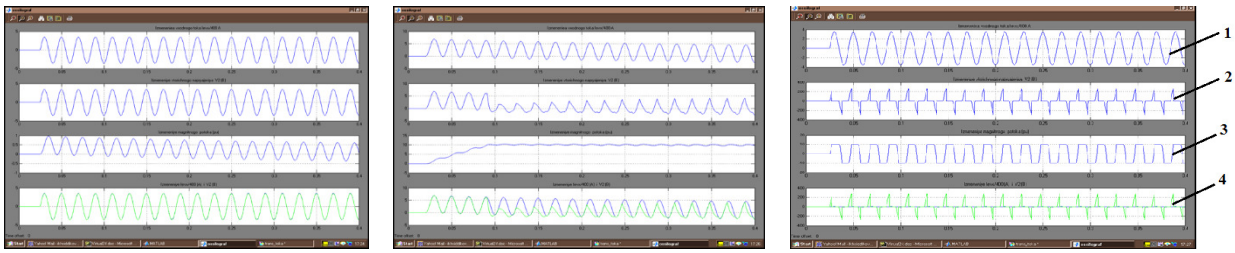

Figure 7. Power supply system (1- the primary outlet – $I_{E\ ENTRY}$), space (2 – m.yu.k. F_μ and magnetic flow - Φ_μ) and exit (4 – the secondary voltage $U_{E\ EXIT}$) changes in the sizes

Conclusion

On the basis of the complex program MATLAB organized research and modelling power systems. As shown results, avoiding the sources of power

supply control electromagnetic switch on the basis of the energy source is connected to the electrical network power installations, power supply will be provided after the 0.044 sec. This value to the process of governing the electricity supply system is that it is small enough to inertia and the need for further research in this area.

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МОДЕЛИРОВАНИЕ И ИССЛЕДОВАНИЕ УПРАВЛЕНИЯ ЭЛЕКТРОЭНЕРГЕТИЧЕСКИМИ СИСТЕМАМИ И ОБЪЕКТАМИ

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Проведенный анализ методов формального представления, моделирования и исследования динамики систем управления, функционирующих в условиях неопределенности, влияющих на режимы работы системы, показывает, что наиболее адекватными задачами является применение гибридных методов, включающих, как теорию нечеткой логики, так и методы теории автоматического управления электроэнергетическими системами и объектами. Показано, что в многоуровневых иерархических системах важным вопросом является решение задачи координации работы подсистем, если в системе имеется неопределенность, то задача принятия решения значительно усложняется. Создана информационно-аналитическая си-