

- Violation of the balance of supply and demand for fossil fuels. Reduction of primary oil and gas supplies due to limited resources and insufficient investment in development within the previous decades against the backdrop of growing demand from rapidly developing national economies.
- Increasing requirements for energy security, the strategic priority of most national economies is the diversification of sources of energy production. Unlike organic fuel, uranium, which is the basic element of nuclear energy, is evenly distributed geographically and has a high energy intensity, which makes it possible to create strategic reserves of raw materials much more efficiently and on a long-term basis.
- Climate change and reduction of greenhouse gas emissions. The need to create sources of energy production that do not produce CO₂ allows us to talk about nuclear energy, along with hydropower, as a non-alternative and environmentally friendly source capable of operating under the base load regime.

For the period that passed after the Chernobyl nuclear power plant accident in 1986, both the technological and operational safety of the nuclear energy has increased significantly. Security systems have undergone serious modernization at all operating power units, and modern nuclear power plants are built using multi-level security systems, including passive ones.

The globalization processes taking place in the world affect the world nuclear energy. As experience of leading states shows, nuclear energy is international, and its further development is directly connected with international economic cooperation and cooperation. At present, nuclear companies and firms are merging into transnational corporations in different regions of the world, the development of which was the development of world nuclear centers.

REFERENCES:

1. Competitiveness of the Russian nuclear industry in the world market - Cherkasenko A. I. – Moscow – 2009
2. International competitiveness of the Russian nuclear power industry – Mirsiyapov I. I. – Moscow – 2009

INVESTIGATION OF SEARCH POINTS FOR THE POINT OF MAXIMUM POWER FOR THE INCREASING SIGNAL INVERTER VOLTAGE TRANSDUCER

Y. Titov

Tomsk Polytechnic University
Institute of Power Engineering, Group 5061

The relevance of the work is determined by the need to increase the energy efficiency indicators of power conversion devices for the needs of alternative energy. Currently, more attention is being paid to alternative sources of energy, including so-

lar energy, due to rising prices for non-renewable energy sources. However, the generation of solar energy has a number of problems associated with the cost of photo panels, their utilization and imperfection of energy conversion devices of these systems. All this requires the creation of power supplies on the modern element base and their control systems, which allow achieving high energy efficiency indicators. To solve these problems, the method of searching for the maximum power point of the boosting voltage converter for solar energy sources using known search algorithms is chosen.

The purpose of the study: the study of various search algorithms for the point of maximum power for systems based on solar cells; development of the structure with the best indicators of efficiency and speed on the basis of the considered typical schemes for converting the energy of solar batteries and their control algorithms; the creation of a physical layout of the final device and the evaluation of its indicators.

Research methods: a review of literature sources on standard schemes of solar energy converters must be based on DC·DC converters and search algorithms for the maximum power point, a comparative analysis of available data with the use of computer simulation tools. Both simulation methods with the help of the Matlab / Simulink program and prototyping with the appropriate experiments are used: adjustment of the PI controller, simulation of different levels of blackout of the solar battery, estimation of the efficiency of the converter.

Results. Simulation models for the perturbation and observation method (adaptive and nonadaptive) and the method of increasing conductivity must be developed, and a study has been made of their applications for different illumination levels. The software for the microprocessor control system of a two-phase up-converter voltage converter has been compiled, and a number of simulations different levels of illumination of the solar battery to evaluate the efficiency of the experimental setup. In the paper, the accuracy of finding the point of maximum power to a value equal to 99% was obtained for a variant with an adaptive step change algorithm. In the experimental study, similar accuracy values corresponding to 95-96% were achieved, with a 10 ms quantization time (for the non-adaptive perturbation and observation algorithm).

The studied must include the device based on the up converter (PPN), which is part of the structure of the inverter for solar batteries as the most promising in terms of mass-size indicators and efficiency. The functional diagram of such a system is shown in Fig. 1 [1].

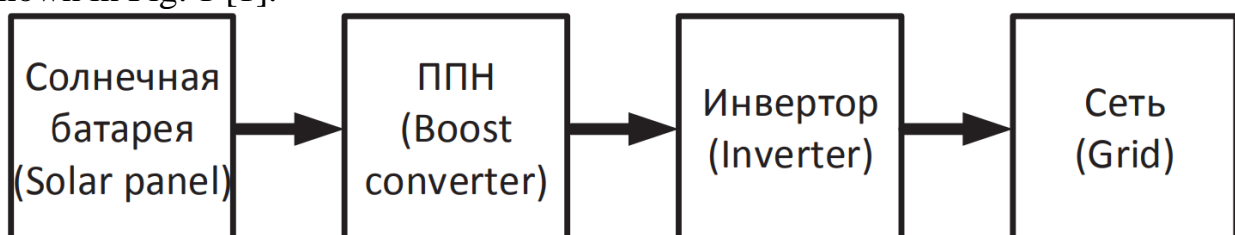


Fig.1. Functional diagram of solar inverter

To extend the range of operation of the solar inverter, a constant voltage converter is used as an intermediate link between the solar battery (SB) and the network inverter, which can also monitor the maximum power point tracking (MPPT), its

block diagram is shown in Fig. 2. As such an energy converter, lowering, boosting, inverting converters or a converter designed according to Cook's scheme can act. Such schemes provide high efficiency due to the reduction of the number of power elements, while the weight and size parameters of the filter are minimized by high conversion frequencies. One of the main ways to increase the energy efficiency of photovoltaic systems is to realize the mode of selecting the maximum power at the corresponding point of the current-voltage characteristic of the solar battery. In Fig. 3 gives examples of the current-voltage characteristics and the volt-watt characteristics (VCI) of the photomultiplier KSM 160 [2].

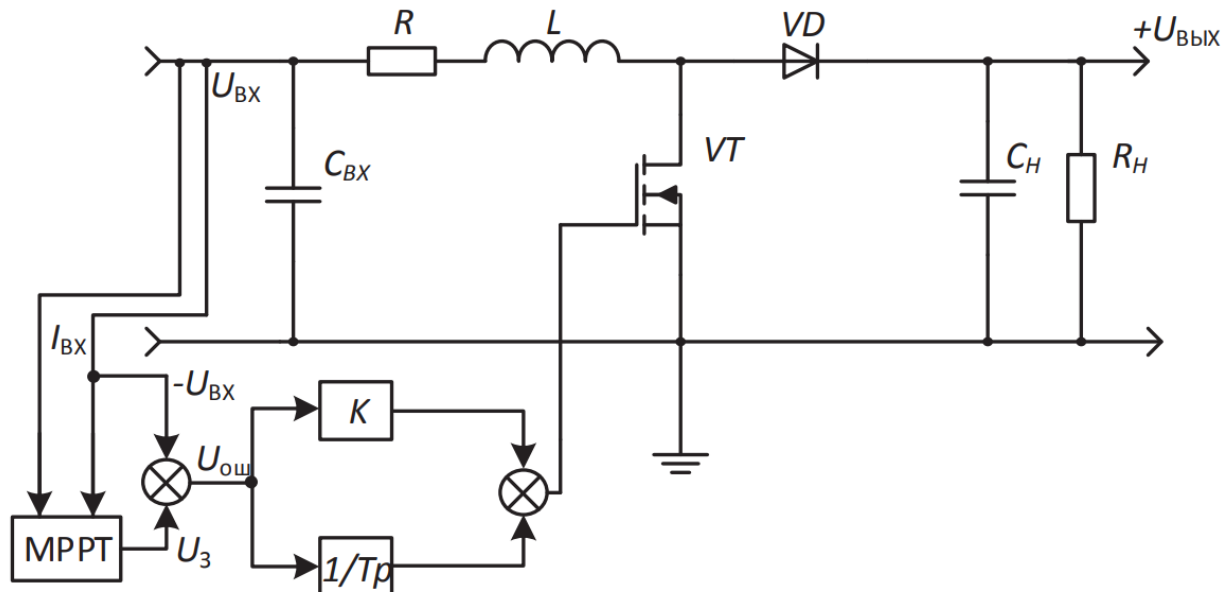


Fig.2. Structure of solar energy converter

REFERENCES:

1. Comparative analysis of energy efficiency formation of energy of a solar battery by converters constant voltage / AV. Osipov, Yu.A. Shurygin, Yu.A. Shinyakov, A.I. Otto, M.M. Black // Reports of Tomsk State University of Control Systems and Radioelectronics. - 2013. - T. 27. - No. 1. - P. 14-19.
2. Characteristics of the photovoltaic module KSM 160 // JSC NPF "Kvant", 2013. URL: www.rusnanonet.ru/download/nano/file/ksm160.pdf (date of circulation: 20.12.2015).
3. Manimekalai P., Harikumar R., Raghavan S. A Hybrid Maximum Power Point Tracking with Interleaved Converter for Standalone Photovoltaic Power Generation System // International Energy Journal. - 2014. - V. 14. - Iss. 12. - P. 143-154.
4. Ruskin Viktor, vrsskn@gmail.com
5. Semyonov Sergey, ssm@tpu.ru
6. Dickson Robert Christopher, robert_dixon@mail.ru