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POWER SUPPLY OF AUTONOMOUS CONSUMERS WITH RENEWABLE AND NON-RENEWABLE ENERGY SOURCES AND CONTROL OF ELECTRIC POWER GENERATION

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Currently, the use of local generating capacity, non-backbone networks and working to ensure the electricity needs of small areas is a global trend. The advantage of using generation capacity low-power operating in local microgrids low voltage, is the ability to reduce the cost of generating a kilowatt-hour of electricity by reducing losses in the transmission of electricity, improve the utilization of generating capacity, reduce downtime, and reduce the cost of its maintenance [3, 7].

One of the ways to reduce the cost of power generation is the use of microgrids generating capacity using renewable energy sources (wind power, micro- and mini-hydro, solar power plant, gas-fired plant using biogas as fuel).

The purpose of research - development of control systems, providing the optimum input and output generating capacity, depending on the specific conditions at any given time to optimize the operation of a distributed system with generation sources on different physical principles.

For example, a condition for the use of wind power plants in the system is the availability of sufficient capacity vetropotokah at this particular point in time, capable of providing load requirements and to provide electricity consumers with quality standards GOST 13109-97. By reducing the power needed to carry out vetropotokah gradual withdrawal of generating vetroenergticheskoy installation with simultaneous generation of input based on other energy source in an amount depending on power demands by the consumer at a given time. This operational management of electricity generation depending on load schedules will significantly reduce the cost of generating a kilowatt-hour by maximizing the use of renewable energy sources and

implementation of the operational management of the generation with the help of a distributed control system.

The results of research. Block diagram of the distributed micro-network is shown in Fig. 1.

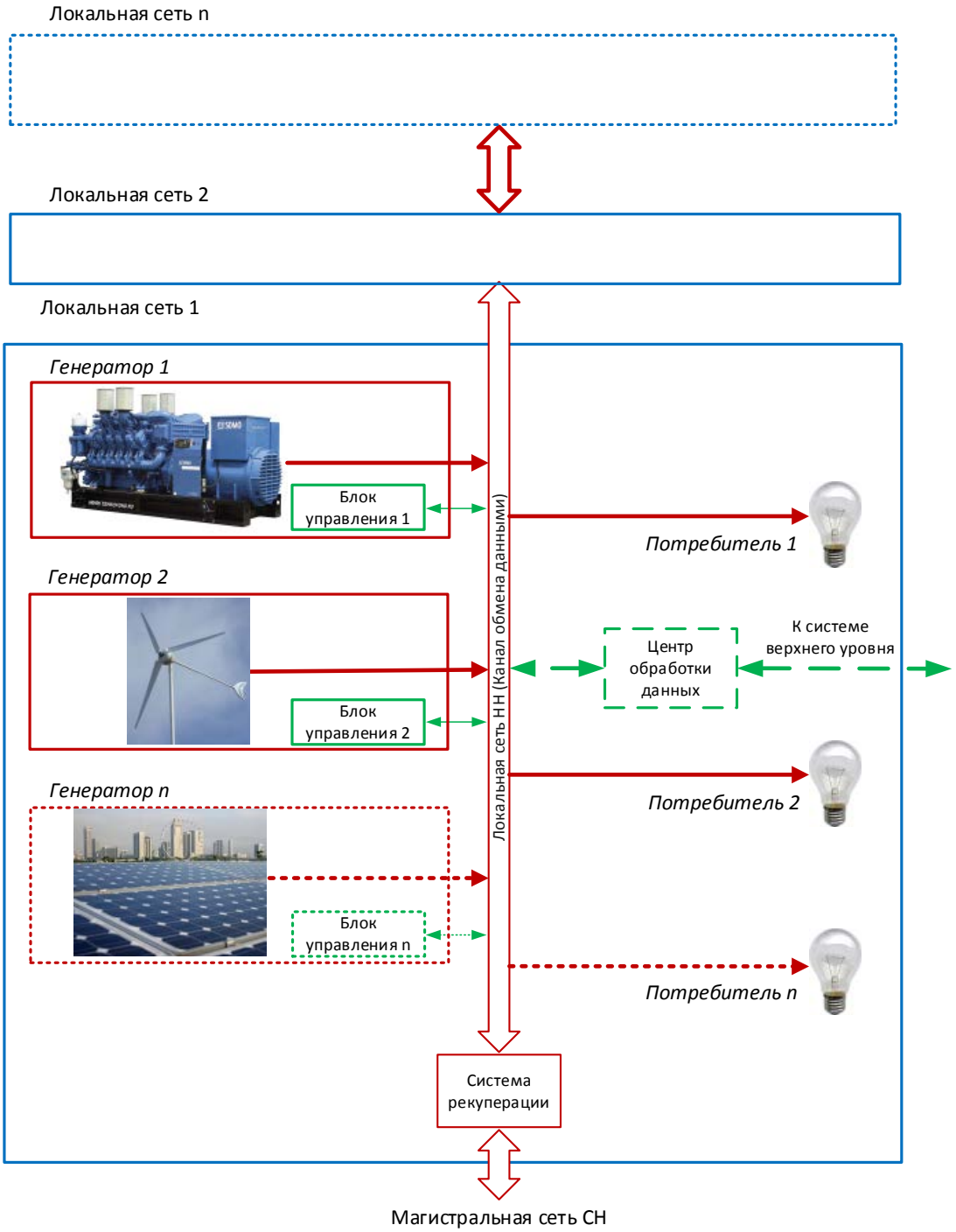

Fig. 1. Block diagram of the distributed microgrids

Generating capacity "Generator 1", "2 Generator" and "Generator n» to control integrated into a single system that provides electricity to customers "Consumer 1", "User 2" and "consumer n». Distributed Control System provides control of generating capacity so that at any given point in time the generation of energy is the source of the minimum cost of generating electricity. A distinctive feature of this system is the lack of a common data center and the need to organize the information channels for the exchange of control information in the system.

At the same time, in a certain way, it is possible to organize the exchange of electricity with the main networks of medium voltage and carry out the connection information distributed control system to a single control point.

A distinctive feature of the method of using the organization of information exchange and the use of distributed control system generation is the ability to scale microgrids microgrids and integration in the energy system running a single control algorithm of the system as a whole.

Using the information data exchange on the electric network provides the possibility of implementing a system for generating electricity using renewable and non-renewable sources of energy while working together in the single electrical low voltage network for generating electrical energy and implementing the method generation control depending on the generation and consumption of electricity on the basis of feedback sensors. This reduces the cost of electricity generated and increase the efficiency of the overall system with the possibility of sharing power with a higher level of energy networks.

A block diagram of a system that implements the method for controlling the generation is shown in Fig. 2.

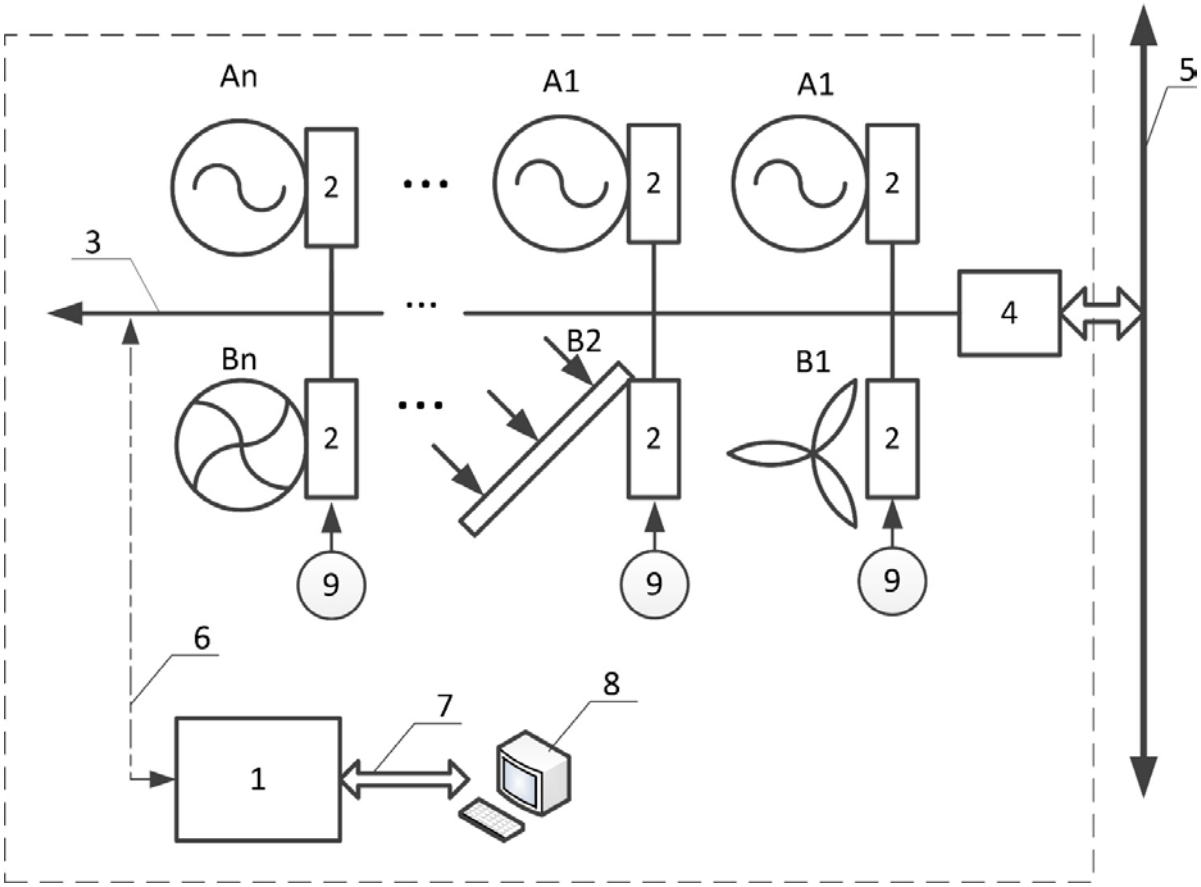

Fig. 2. Block diagram of the control system generation

The method consists of analyzing environmental data (wind speed and direction, the value of solar radiation, the water flow rate, volume and pressure of the biogas in the line), the voltage and frequency on the power input from the main power line and load power. Based on these results the algorithm is implemented to select the most optimal power generation to provide electricity consumers with quality in accordance with GOST 13109 and at the lowest cost of electricity. If you change the state of the environment and (or) consumption produced a change of power generation.

The system implements the claimed method includes a stationary control system 1, the local control unit 2, which are mounted directly on the power generation using non-renewable energy A1 ... An are (diesel, the main gas, fuel oil), as well as sources of generation, using renewable energy B1 ... Bn (wind power,

mini-hydro, solar panels, biogas generators). A local control unit mounted on the power generation of renewable energy and data broadcast information from environmental sensors 9 in the fixed system control information channel 1 through 6 is used as the transmission medium WLAN 3. All low-voltage sources generate a combined WLAN low voltage 3, to deliver electricity directly to consumers. LAN uses a low-voltage system for the exchange of electric power with backbone power grid 4 medium or high voltage 5. Stationary control system 1 has an information channel 7 for data exchange and transmission control system of the upper level 8.

A system implementing the inventive method operates as follows. Electric power from the backbone network 5 through the exchange system 4 is supplied with electric power to consumers. Stationary control system 1 examines the load on the network and the environment through sensors 9. With sufficient vetropotokah, solar radiation and water pressure through the local control unit 2 installed at each power generation in the local network 3 is introduced replacement generation, with capacity backbone network output so that as the main source of generation to generation microgrids maximum use of renewable energy resources B1 ... Bn. In case of excess power from the local renewable energy sources B1 ... Bn its recovery is performed through exchange of electric energy 4 in the backbone network 5. At peak load in the network, if the power generation from renewables B1 ... Bn is insufficient, and in case of lack of connection to the backbone network is used to enter the network generation from renewable energy sources A1 ... An so as to have the benefit of sources with cheaper fuel (use of gas-fired generation has an advantage over diesel, diesel - petrol before). Stationary control system 1 is continuously controlled sources of generation A1 ... An and B1..Bn so that at any one time, depending on the load changes on the local network 3 to perform a change of generation in the local network by controlling the sources of generation in terms of local control units 2, as well as to ensure optimum energy exchange with higher-level networks. Each such local system can be integrated as part of a larger network, and be running the top-level 8 through an information communication channel 7.

Conclusions

A system for controlling the generation of energy from renewable and non-renewable sources, which provides operational management of the generation, depending on the power consumption and the possibility of using renewable energy sources. As a physical medium for the transmission of broadband signals control the generation of such a system it is planned to use a physical medium transmission.