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The algorithm of the electrical system of the enterprise from autonomous sources

Abstract: *The progressive transformation of society and nature are not possible without the constant energy costs. No human activity can not be implemented without the use of various forms of energy. The slightest threat to ensure energy leads to higher prices and pessimistic forecasts about shortages of energy raw in the future. Energy trade by volume than all other articles, as the energy in the form of fuel is used to maintain the regularity of the world: transportation, construction, agriculture and industry.*

Unlike traditional energy using coal, oil, gas, and are a major source of environmental pollution, alternative energy conventionally referred to as non-polluting energy source. In terms of ensuring the growing problem of mankind energy resources, as well as complex environmental situation the development of alternative energy sources are particularly relevant in the world.

Keywords: microcontroller, solar energy, solar cell, wind power installation, pulse-width converter, solar radiation, automatic control system, power supply system.

The algorithm works is that the first microcontroller is pending. We note that the microcontroller has 4 priorities:

1. Solar energy conversion;

2. The conversion of wind energy;
3. Electrical Power Generation of an internal combustion engine;
4. The cost of energy from the battery.

Once the microcontroller to signal a need for receivers of energy in electric energy, it begins to interrogate solar panels.

Determine the state of the solar cell (working or not working, or energy from it). If does not work or does not receive power, the microcontroller interrogates wind installation. When working with energy from solar batteries, it is necessary to compare the amount of energy received and the amount of energy required receivers electricity. If energy is missing, then turn to wind power installation. If equal to or greater then sent to the receiver of electricity, and the balance to the battery.

Determine the status of wind power installations (working or not working, the energy coming or not?). If not supplied energy or does not work, refer to the Electrical with internal combustion engine.

When working with incoming energy is added to the energy produced by the solar cell (if it initially lacked) and compare the number. If energy is missing, then apply to the Electrical with internal combustion engine. If equal to or greater then sent to the receiver of electricity, and the balance to the battery.

Determine the condition of Electrical combustion engine (enabled or not is fuel or not?). If no fuel or does not work, refer to the battery. If enabled and is fuel, then add the energy of electro with an internal combustion engine to the total number (in case of solar panels and wind power installations are not enough) and compare energy. If missing, then turn to the battery. If missing, then sent to the receiver of electricity.

Rechargeable battery acts as a buffer element and redundant power supply. In case none of the energy sources can not meet the energy needs of the farm, the microcontroller has to send a signal to deactivate the system. This situation is undesirable for farming, as in this case will not be satisfied with its energy needs.

Therefore, the development of automatic control system of power supply system must use methods that allow for automatic control system to respond to external stimuli, which may lead to shutdown of power supply enterprise.

The system power supply includes:

1. The solar radiation sensor;
2. The wind speed sensor;
3. The wind power installation;
4. The solar cell;
5. Electrical with an internal combustion engine;
6. The battery pack;
7. The pulse-width converter;
8. The power current sensors;
9. The power sensor voltage;
10. The power analog-to-digital conversion;
11. Standalone inverter;
12. Panel operator;
13. The personal computer;
14. The display unit;
15. The switching power sources;
16. The microcontroller.

Solar radiation sensor is designed to determine the level of solar radiation at this time. Wind speed sensor is designed to determine the wind speed at the present time for making a decision on the possibility of using wind power. Wind and solar energy received by the appropriate converters (wind and solar panel installation). Then power current sensors measure current from each source of energy and overall cost of the energy is transmitted to the consumer. Block of voltage sensors designed to measure the output voltage of each power source and the battery pack, which is a buffer element and ensures uninterrupted power supply when disconnecting all sources of energy.

For sampling the maximum power from the solar panels and wind power installations used pulse-width converter. Information from the sensors is fed to block the conversion of analog to digital and then digital data fed to the microcontroller. According to the developed algorithm of the microcontroller decides on connecting to certain sources of independent inverter, which converts direct current to current industrial voltage and frequency (220 V, 50 Hz) and transmits energy receivers electricity. In addition, the microcontroller generates control signals which are fed to the switching unit source by connecting the appropriate power source to the inputs of the battery and autonomous inverter. To control the state of the system in a block diagram provides indication that signals the connection of a power source, emergencies and more. Visual observation of parameters of the system is done via the operator panel and PC, which displayed current information on load profiles, energy consumption and so on.

Solar radiation sensor determines the level of solar radiation at the present time for making a decision on the applicability of solar panels. The gauge wind speed determines the speed of the wind now for a decision on the applicability of wind energy and wind power installation to protect from work at high speeds.

Pulse-pulse converters act as sampling devices maximum power from solar panels and wind power installation.

In the study of the existing control system on the experimental facility revealed the following main disadvantages:

1. Implemented in this system was not sufficient to take into account climatic and meteorological conditions of the terrain, resulting in inefficient operation of power plants and, consequently, to part the energy needs of the consumer;

2. The control system was carried out in semi-automatic mode (the need for manual operation with electro internal combustion engine);

3. Imperfect algorithm of the present system of control (manual control of electro with internal combustion engine) resulted in the frequent use of the battery (which is undesirable, since it reduces their life work) and customer

outages because the consumer has not always had the opportunity to enable timely Electrical with internal combustion engine in case of need to use it.

Solar and wind energy can not be in the Kiev region fully meet the needs of the enterprise. There are so-called "gaps" where the main sources of energy (solar and wind) can not meet the needs of companies that must fill a reserve source of energy that is electro with an internal combustion engine.

Consequently, the costs that may arise during the operation of the system will be connected with the work of Electrical combustion engine as fuel for his work has a certain value and the consumer will bear certain costs associated with the purchase of fuel.

Automating the process of management of power supply enterprise independent energy sources is recommended in sequence.

For this purpose the following method:

1. Determination of the energy needs of the enterprise.
2. It is necessary to determine the energy potential energy of the sun and wind.
3. Determination of the territory, which is planned to place solar panels.
4. It is necessary to determine the number of solar panels that can be placed on a particular area.
5. Determination of the total capacity of solar cells.
6. It is necessary to determine the capacity of wind power installation.
7. Select the setting of an internal combustion engine and determine the required capacity of storage systems.
8. Determination of unit cost of power plants, in order to calculate economic efficiency criteria.
9. For selected using the criterion of economic efficiency solar panels and wind turbines, to modeling their work, in order to analyze opportunities to meet the energy needs of the enterprise and the establishment of the relationship between power consumption and power supply company.

10. Based on an established relationship to determine the ranges of input parameters control object, to create automatic control system of power supply system (ACS PSS) of the company.
11. Develop ACS PSS electrical system of the company.
12. Run the practical implementation of ACS PSS of the company.

The advantages of using solar panels include:

- Autonomy;
- High reliability;
- Reduce the cost of hot water and heating to 85% (solar energy is free);
- Saving of fossil fuels (oil, gas);
- Reduction of carbon dioxide emissions;
- Accessibility and inexhaustible source;
- No intermediate phase power conversion.

Semiconductor solar cells have a very important advantage - durability. Theoretically, complete safety to the environment (clean energy) and human (technical security meets all international standards). Distribution of solar installations in the population and the industry has a positive effect on the energy security of Ukraine. According to the principle of the solar cell is a photovoltaic DC generator that uses the effect of the conversion of radiant energy into electricity. More precisely, the solar-powered property used semiconductors based on silicon crystals. Quanta of light falling on the plate semiconductor knock an electron from the outer orbit of an atom of the chemical element that creates a sufficient number of free electrons for the emergence of electric current. In addition, the system of solar energy worked and submitted to the network, you must install a number of additional appliances, including:

- An inverter that converts direct current into alternating;
- The battery, the role of which store energy and smooth the voltage drops due to changes in illumination;
- Battery charge controller, which prevents battery discharge or recharge advance.

Since the solar cell area of 10m2 can get even bigger than 1kW energy that can provide the computer, the TV, a few light bulbs. Disadvantages of solar panels as a source of energy, not so much, but unfortunately they are very convincing and specific:

- High cost and consequently a long payback period;
- Dependence on weather conditions.

Average annual total solar radiation arriving at 1 m of the surface on the territory of Ukraine is in the range from 1000kVt h / m in the northern part of Ukraine and the 1400kVt h / m in the Crimea. To navigate around what it was about it, it can be characterized as those numbers - solar energy that actually comes in three days on the territory of Ukraine, more than the entire annual energy consumption of electricity in the country. A duration of sunshine hours (no solar radiation and direct solar radiation) during the year in the north-western part of Ukraine 1600 - 1700 hours. In the forest-steppe zone, it increases to 1900 - 2000 hours per year. The steppe zone of the sea coasts reaches 2300 - 2400 hours per year. The maximum sunshine in the Crimean Mountains - 2453 hours per year. Of course, the closer to the equator the higher the number of hours of sunshine a year and in countries such as Turkey, Bulgaria, Spain, Portugal, Egypt and so on. E. The effective use of solar systems occurs throughout the year. The average potential of solar energy in Ukraine (1235 kWh / m) is sufficiently high and much higher than for example in Germany - 1000 kWh / m or even Poland - 1080 kWh / m. So, we have good opportunities for effective use of thermal power equipment in Ukraine. It is reasonable and economic potential - the amount of energy that should be used for the purpose of replacement of traditional fuels and energy, taking into account the following factors:

- Economic;
- Environment;
- Technical and technological;
- Social;
- Political.

The total potential solar energy Kyiv oblast is 31.5 MWh / year. The technical potential of solar energy - 15.5 MWh / year. It is reasonable and economic potential of solar energy - 2.4 MWh / year.

According to the data, the average potential of solar energy in Ukraine reaches 1235 kWh / m, so 100-kilowatt power plant will produce annually 123,500 kWh (kilowatt hours) of electricity. Suppose 15% of the energy is lost during conversion and transmission. It remains to 104,905 kWh. The guaranteed selling price - 60 cents per 1 kWh. However, the net proceeds from the sale will be 62,943 USD. per year, and the other factor - is the protection of nature, like solar energy:

- A clean energy source that can be used on a large scale with no negative impact on the environment

- Solar energy - it is virtually inexhaustible source of energy that will be available and a million years.

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