XXIII R-S-P seminar, Theoretical Foundation of Civil Engineering (23RSP) (TFoCE 2014)

BIM-Technology in Tasks of the Designing Complex Systems of Alternative Energy Supply

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Abstract

Article is devoted to the use of alternative energy, the development of which in recent years has been to acquire innovative. The authors investigate the existing methods of calculating automated supply systems for individual low building based on solar panels, wind power stations, geothermal systems separately and in combination, are considering Building Information Model (BIM) technologies that can be used in automation engineering design of such systems.

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Peer-review under responsibility of organizing committee of the XXIII R-S-P seminar, Theoretical Foundation of Civil Engineering (23RSP)

Keywords: BIM; CAD; construction; alternative energy; solar panels; wind power station; energy efficiency.

1. Introduction

The use of alternative energy sources for electricity and heat developing regions remains a promising direction in the economy.

Experience in other countries and elementary logic suggests that the future of compact individual solar and wind power plants autonomous. Quality and reliability of power - one of the most important conditions for reliable and efficient operation of any energy supply system.

From the proper operation of electrical systems depends on the work of other engineering systems and equipment, and especially security systems and information systems. In this connection it is necessary to pay more attention to the design of engineering systems, use of new technologies that will help reduce the cost of creating the project documentation. Building Information Modelling is one such technology. Building Information Model (BIM) - a three-dimensional model of a building, or another building project-related information database, in which each "element of model", you can assign additional attributes. The feature of this approach is that the construction site is actually designed as a unit of "elements and standards." Changing any of its parameters entail automatic change.
other related parameters and objects. These changes has influenced on the drawings, renderings, specifications and timetable.

BIM software is based on the parameterization, so the main idea is to create a parametric relationship between the location of the installation of solar panels, wind power stations and building object (BIM-model). In this case, the automated matching system of complex system can be an additional module, such as ArchiCAD, Revit. Of course then if you need to export your model to another software you can use IFC-format [1-5].

2. Results and discussion

From a practical point of view the biggest challenge systems that feed solar and wind energy, it is their ability to maintain the stored energy. Compact capacitive batteries are needed that would ensure the conservation of energy for a long period. On windless time (if the source is a wind turbine) or maintaining the accumulated day period for solar energy for use at night.

The development of the design and implementation of capacitive battery is directly related to the automotive industry. This sector of the economy is as always in demand. Well-known car companies in Germany and France have already started serial production of electric vehicles. While relatively compact batteries already known models provide autonomous running their trucks from 130 to 200 miles without recharging.

Obviously, customers and developers the latest Electric will not rest until surpass this indicator cars with internal combustion engines - that is 500-600 km.

Note that currently there is an intensive process of introducing new, advanced technologies in the production of batteries to make them smaller and more electric capacity.

Using wind energy occurs in wind generators to obtain electricity. This source of energy is fundamentally different from the primary sources of energy, as there are no raw materials and no waste. The only important requirement for a wind turbine is a high average annual wind. Currently, based on the capabilities of the market, you can for very reasonable money to buy a wind installation and provide energy independence for many years his house. The task of autonomous or nearly autonomous power supply from wind energy housing complex is still present. To accomplish this task, the propeller wind turbine should have a diameter of about 20 m Therefore, the use of wind turbines in the household should be considered in terms of significant cost savings for the production of heat and reduction of energy consumption of the network.

According to UNESCO for a confident and comfortable accommodation in a country house, the power consumption should be less than 2 kWh night. According to experts, who were monitoring the power consumption of several dozen families, the actual power consumption a family of three is 3, 5 kWh per night (lights, TV, computer, pump, and fridge). Wind turbines, serially produced by different manufacturers 1000W - 2000W, and with an average wind speed of 5 m / s are capable of producing 8 kWh to 15 kWh per night. That is, it can provide an independent power supply for a minimum of a country house.

The following alternative energy sources are solar energy. Wind turbines are a good substitute for traditional sources of energy. But they are not without drawbacks. While the flow of wind turns the blades generator, wind turbine supplies properly house his energy, but if calm, there is no electricity. If this happens during the day, the solar panel can help. If the sun is shining brightly - then about 15 square meters enough to power a medium-sized private house (100m² - 150m²). The best option - set with wind power and solar panels that can provide electricity consumers not only in windy weather, and in absolutely any.

The main objectives in the creation of complex energy systems based on renewable energy sources is to ensure their reliable batteries and energy to create an effective auxiliary equipment to reduce fluctuations of the parameters of power systems and maintain the necessary operating parameters, as well as the creation of equipment for automatic control mode of operation. The example of such a complex energy system is presented in figure 1. The optimum ratio of the individual elements in integrated energy systems based on renewable energy is determined taking into account the many factors affecting the operation of power systems, so their development research is needed for each object. The first step is to determine the energy efficiency of operation in the field of implementation.
Wind power stations and solar panels generate electricity is distributed by means the automatic control mode of the complex energy system for subsequent use. It first charges the batteries that provide power lamps lighting, radio and television equipment, in the second place is the charge of the heat accumulator. In a thermal battery and comes all the excess electricity from wind turbines substandard and photocells, as well as thermal energy from solar panel. Solar power stations is mainly used for domestic hot water needs and partly heating needs. During the warmer months, when the needs of the economy falling into heat, hot water produced during operation solar is used for process temperature maintenance bioenergetics reactor [6, 7, and 8].

Complex energy systems from renewable sources, designed for energy consumers of heat and electricity, must be equipped with an integrated storage system of electricity and heat to equalize fluctuations in loads of heat and electricity networks, resulting uneven frequency and energy, and to increase the efficiency of use power plants. Binding is also effective use of auxiliary equipment necessary to maintain the performance and operation of the automatic control of CES.

The essence of the effectiveness of integrated energy systems based on renewable energy in the first place is the conservation of traditional energy resources. For evaluation were chosen such basic criteria: economic efficiency (payback period), eco-efficiency, which is the consequence of reducing the consumption of fossil fuels (protection and renewal of the environment), social efficiency (increasing employment, improving quality of life).

3. Conclusions

Environmental problems and the ever-increasing growth of prices on oil, coal and natural gas make us look for ways to solve them. Humanity and alternative energy - it is a reality today.

Almost everything depends on our understanding of and our future actions. Must believe in the positive results of increasing the use of alternative and renewable energy sources, including in the home, it has been proved practice.

To create new efficient complex energy systems and to determine the optimal mode of operation, it is necessary to further development of scientific bases of renewable energy with the use of modern logistics, methodological and information-analytical support that will accelerate the implementation of research, design and experimental work with the introduction of integrated energy systems based on renewable energy sources.

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