

Name of the project: IRN AP19677354 Development of indirect thermal protection systems for asynchronous generators of wind power plants

Relevance: One of the directions of alternative energy is wind energy converters into electricity (wind generators). Asynchronous energy converters are usually used when wind generators work together with the industrial frequency electrical network.

Asynchronous generators, working as a converter of wind energy into electricity, are subject to external disturbances, often of a stochastic nature, and as a result, the load of the asynchronous generator can be much higher than the nominal values.

One of the problems of the technical implementation of thermal protection for asynchronous generators of wind farms is the current temperature control of the stator windings. The implementation of current protection of the stator windings does not take into account the intensity of air cooling of the asynchronous generator, structurally located in the upper part of wind farms.

Currently, thermal relays included in the electrical circuit of its total load are used to control the temperature of an asynchronous generator. The disadvantages of this method of protection include not taking into account the intensity of air cooling of the generator and the temperature constant of heating, which reduces the efficiency of temperature control of the stator windings of the generator.

The thermal protection of the stator winding of asynchronous generators relies primarily on measuring or determining the winding temperature. The reliability and timeliness of the information received by the protection system about the temperature of the corresponding elements and assemblies of asynchronous electromechanical energy converters is a key factor in preventing damage to the insulation due to overheating in order to extend its service life.

The most effective way to protect the stator windings of an asynchronous generator of a wind farm from exceeding their temperature, taking into account the dynamic characteristics of the load and the cooling intensity, is an indirect method of calculating the temperature, based on calculating the current value of the active resistance of the stator windings.

Purpose: research and development of methods and means of indirect thermal protection of asynchronous generators of wind power plants, taking into account the processes of heat generation and heat removal.

Expected and achieved results: The results of the project make it possible to create thermal protection systems for asynchronous generators of a wind farm; to develop methods for indirect calculation of temperature, as well as with the introduction of a pulse component in the power supply circuit of the stator windings of asynchronous generators of a wind farm.

The forms of implementation of the project result will be:

- at least 3 (three) articles and (or) reviews in peer-reviewed scientific publications indexed in the Science Citation Index Expanded of the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 35 (thirty-five);
- at least 3 (three) articles in a peer-reviewed foreign or domestic publication recommended by CQAFSHE;
- development of scientific and technical, preliminary design documentation.

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Information for potential users: The proposed scientific project is aimed at improving the reliability of asynchronous generators of wind farms and are important for the development of wind power.

Additional information: The field of application of the development can be agricultural enterprises remote from power supply systems and industrial enterprises that generate electricity.