

**DEVELOPMENT OF INNOVATIVE TECHNOLOGIES TO IMPROVE
THE LEVEL OF ELECTRICAL SAFETY IN SHORT NETWORKS WITH
VOLTAGE UP TO 1000 V ON RENEWABLE ELECTRICAL POWER
SOURCES AND AUTONOMOUS POWER STATION**

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One of the main factors of the renewable electrical power sources and autonomous power station effectiveness reduction is the phase insulation damage due to earth. Since the reliability of short network operation related to the insulation damage in the existing electrical systems (up to 1000 V), therefore the issues of personnel electrical safety are also open.

It should be noted that staff who works on the renewable electrical power sources and autonomous power station, both in our country and abroad, can receive an electric shock of fatal intensity as a consequence of an accident. During the survey of accidents, just organizational measures were done, in order to prevent the electric shock received by people who work at the station. On technical measures necessary operations were not carried out. Hence, for people working on the renewable electrical power sources and autonomous power station, the possibility of receiving electric shock is still on high level.

Prerequisites for solving the problem are that the operation of electrical installations of the renewable electrical power sources and autonomous power station is produced with proper insulation monitoring and ensuring effective protection against human electric shock in the network with isolated neutral with voltage up to 1000 V for the renewable electrical power sources and autonomous power station.

Analysis of the condition of insulation researches on renewable electrical power sources and autonomous power station, as in our country and abroad, has not been performed yet. Furthermore, the parameters of the state of insulation in relation to the device tripping are also not analyzed. Thus, there is a need to develop innovative technologies to ensure reliability and increase the level of electrical safety during operations on the renewable electrical power sources and autonomous power station electrical installations.

Preventing the emergence of single-phase earth fault is possible by monitoring the insulation resistance of the network due to ground, predict the possible occurrence of a single-phase ground fault and make activities which will exclude that fault mode. However, nowadays, the insulation parameters determination methods are not widely used. It happens because during the measurements a significant number of transactions should be done, or it is related to

the complexity of the electrical quantities measuring schemes for which mathematical relationships are used to determine unknown quantities, as well as the use of ammeter-voltmeter method. All these reasons also contribute to reduce the electrical safety of the personnel occupied to take the measurements.

In the practice of renewable electrical power sources exploitation, there are no effective methods and devices to protect people from electric shock in a network with isolated neutral with voltage of up to 1000 V for the renewable electrical power sources and autonomous power station. Therefore, the development of methods and devices to protect human from electric shock in the network with isolated neutral with voltage up to 1000 V for the renewable electrical power sources and autonomous power station is still open.

Based on the foregoing, the task of technical maintenance of reliability and the improvement of the level of electrical safety during renewable electrical power sources and autonomous power station electrical installations operation consists in developing:

- the insulation values control method and single-phase circuit current value;
- a mathematical model of insulation condition and a way to protect human from electric shock in the network with isolated neutral with voltage up to 1000 V.

Thus, the task is relevant and has great scientific and practical importance not only in our country, but also abroad.

Effective solutions for insulation control of innovative method and protection device against electric shock in a network with isolated neutral voltage of up to 1000 V for the renewable electrical power sources and autonomous power station, in comparison with similar development of the United States, Malaysia, Germany and Russia, allow to provide the priority of the Republic of Kazakhstan on increasing of reliability and electrical safety levels during operation with electrical installations.

For example, nowadays people protection devices (from electric shock) effectively work under the condition that the total insulation resistance commensurate with phases capacitive insulation resistance of electric network due to ground. But in short networks of renewable electrical power sources and autonomous power stations ratio of full and capacitance network insulation is violated, that leads to the failure of existing protection devices from electric shock.

Based on the foregoing, it follows that the task of technical reliability and the increase of the level of electrical safety in the operation of three-phase electrical networks with isolated neutral voltage up to 1000 V, consists in the development of: methods of monitoring the insulation condition based on the use of neural networks.