Name of the Project:

AP22787517 Development and approbation of a prototype device for measuring network insulation parameters in ungrounded systems

Relevance:

The expected results of the project include the development and implementation of new technologies for measuring and controlling the network insulation parameters, which will provide increased measurement accuracy and improved safety of network operation. This will contribute to reducing the risk of accidents, minimizing damage from electricity distribution, and reducing costs for repair and restoration after accidents.

The project's significant contribution to the scientific research and technological environment lies in proposing new research directions and methods in electrical power engineering, strengthening the scientific and personnel potential of scientific organizations in Kazakhstan, and increasing their competitiveness at the international level. The results of the project, oriented towards commercialization, will impact the solution of pressing socio-economic and scientific-technical development challenges of the Republic of Kazakhstan.

Target:

The target is to develop a universal method for ungrounded systems to determine the network insulation parameters and electrical schematic solutions up to 1000V for the implementation of a device prototype that enhances the reliability and safety of power supply.

Expected Results:

1. Analytical review of scientific and technical information on the project theme for the selection of the object, subject, and directions of research.
2. Creation of new mathematical dependencies for determining network insulation parameters in ungrounded systems up to and above 1000 V under the condition of symmetric insulation admittance of phases relative to the earth.
3. Development of a new mathematical apparatus for determining network insulation parameters in ungrounded systems up to and above 1000 V under the condition of asymmetric insulation admittance of phases relative to the earth.
4. Development of schematic solutions for conducting experimental research and creating a laboratory bench.
5. Development of the programmable logic of the device prototype based on phase-locked loop frequency adjustment, fast and discrete Fourier transformation.
6. Conducting experimental research on a laboratory bench to select and justify optimal volt-age measurement schemes.
7. Assessing the impact of various methods and means of measuring three-phase voltages on the accuracy of determining network insulation parameters relative to the earth.
8. Creation of a prototype device for monitoring network insulation parameters relative to the earth based on the obtained data.

9. Conducting comprehensive testing (approbation) of the created prototype device in laboratory conditions to evaluate its expected characteristics.

10. Adjusting the parameters of the created prototype device to improve its accuracy and efficiency.

11. Conducting practical tests of the developed device in real conditions at a mining enterprise, assessing its advantages, reliability, and potential for scaling in a production environment.

12. Creation of Technical Specifications (project) for experimental design work «Development and creation of a device for network insulation control».

Members of the Research Team:

No.	Full Name	Role in the project	Academic degree, title, position	H-index, ResearcherID, ORCID, Scopus Author ID
1	Kurabayev Iskander Kazbekovich	Project Manager	PhD, Senior Lecturer	H-index in Scopus-1 database, ScopusAuthor ID: 57473761100, WoS ResearcherID: HCH-6256-2022 ORCID: 0000-0002-4331-4726
2	Sarsikeyev Yermek Zhaslanovich	Leading Researcher	PhD, Associate Professor, Head of Department	H-index Scopus-5, Web of Science – 4, Scopus Author ID: 56252099900, WoS Researcher ID: I-9900-2016. ORCID: 0000-0002-7209-5024
3	Kurabayeva Asiya Besembaevna	Senior Researcher	Master of Technical Sciences, leading specialist of the Astana branch of Exilon Energy LLP	-
4	Zhantlessova Asemgul Beisembaevna	Researcher	PhD, Acting Associate Professor	H-index Scopus-3, Web of Science – 1, Scopus Author ID: 56257910200, WoS Researcher ID: HKW-2626-2023. ORCID:

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5	Turssunbaeva Gulzhamal Uyezbekovna	Junior Research	Master of Technical Science, Senior Lecturer	Web of Science Researcher ID: ABM-8952-2022 Scopus Author ID: 58070501300 ORCID: 0000-0002-2044-8027

Information for Potential Users:

The economic effect is achieved by reducing damage to consumers from power supply interruptions and reducing the costs of repair and restoration after accidents.

The results of the project are of international importance, since the methods and technologies being developed can be applied in many countries with similar power systems. Export of the developed technologies will improve the reliability and safety of power supply.

Additional Information:

The project includes an analytical review of modern scientific and technical solutions, the creation of new mathematical dependencies for networks with different insulation admittances of phases relative to the earth, the development of a device prototype, and its testing in both laboratory and real operating conditions. The main approaches to conducting research include the use of Millman's theorem and the method of symmetrical components for asymmetrical phase voltages, as well as the application of phase-sensitive analysis for safe neutral shifts.