

INNOVATIVE TECHNOLOGIES IN THE FIELD OF ELECTRICITY SUPPLY

Oleksii Ihnatov

*Educational and Research Institute of Energy Saving and Energy Management,
National Technical University of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute”*

It has long been no secret that technology is following us everywhere. The 21st century is a time when humanity is developing at a frantic pace, and there are no limits to new discoveries, including power supply technology. Every day we face new challenges that require modern solutions, and it is these challenges that give us the impetus to improve our technologies. So now I will talk about several new technologies.

1. An innovative approach to solving the problems of traction network protection at DC traction substations

Ensuring reliable operation of converter units and protection of electric transport power distribution systems from the destructive effects of emergency

currents depends mainly on the performance of protective devices. In response to the requirements to provide effective solutions that would contribute to the reliable protection of DC electrical circuits in case of short circuits and overloads, as well as to increase the reliability of power supply, Pluto offers an innovative solution - an ultra-fast-acting arc-free DC circuit breaker AFB, which is used in power distribution systems at tram, trolleybus, light rail, and subway traction substations.

The solution is based on the principle of breaking the power circuit in a vacuum. This principle made it possible to eliminate the release of plasma during tripping and to use 2 times less working space compared to circuit breakers with traditional switching and arc suppression. In addition, the absence of a destructive arc significantly reduces the risk of fire. The environmental friendliness and safety of this solution is ensured by the absence of polluting and toxic combustion products, as well as the deposition of combustion products on the circuit breaker elements and switchgear structures.

The AFB circuit breaker provides high-speed opening of power contacts (intrinsic tripping time is < 1 ms) and the ability to trip by the rate of current rise until the short-circuit current trip setpoint is reached.

2. Using artificial intelligence

The specifics of energy supply services, namely the need to process large amounts of information on weather forecasting, energy consumption and production, equipment condition, power lines operation modes, etc. in real time, opens the way for the use of AI in the energy sector. For example, weather forecasting can predict changes in consumer energy needs and, accordingly, better plan the operation of generating facilities to increase the efficiency of existing installations. AI can also stabilize the energy transmission system, for example, by detecting anomalies in production and consumption patterns and developing appropriate solutions to eliminate such anomalies in real time (on-line), connecting/disconnecting energy sources or additional equipment to ensure the stability and reliability of the system (Sukhodolia, 2023).

By increasing the availability of data, AI provides better forecasting of the

operating modes of energy distribution systems. For example, the timing of maintenance in the power grid can be determined by the availability of information on design life, off-design modes, and the level of wear and tear of individual elements, equipment, or materials, which significantly reduces network accidents and costly downtime.

References:

Sukhodolia O. M. (2023). *Shtuchnyi intelekt v enerhetytsi [Artificial intelligence in the energy sector]*. Retrieved from https://niss.gov.ua/sites/default/files/2022-07/dopovid-ai-v-energetici-red_01-pogodzheno-sukhodolya_02-1.pdf

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