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**ASSESSMENT OF QUANTITATIVE RISK INDICATORS OF
ELECTRIC POWER SYSTEM OPERATION IN CASE OF
FAILURE OF THE LOADS WITH RESPONSIBLE
CONSUMERS**

E. Bardyk¹, O. Bondarenko²,

*National Technical University of Ukraine "Igor Sikorsky Kyiv
Polytechnic Institute", Department of Renewable Energy
Sources, 37 Peremohy Av., 03056 Kyiv, Ukraine*

The article presents the basic ideas of assessment of quantitative risk indicators of electric power systems operation in case of failures of load with responsible consumers. It is proposed to use an integral risk index of functioning when evaluating the operational reliability of the EPS.

Keywords: *reliability, electric power system, failures.*

**ОЦІНКА КІЛЬКІСНИХ ПОКАЗНИКІВ РИЗИКУ ЕКСПЛУАТАЦІЇ
ЕЛЕКТРОЕНЕРГЕТИЧНОЇ СИСТЕМИ ПРИ ВІДМОВАХ
ОКРЕМИХ ПІДСИСТЕМ З ВІДПОВІДАЛЬНИМИ
СПОЖИВАЧАМИ**

Є.І.Бардик¹, О.Л.Бондаренко²,

*Національний технічний університет України «Київський
політехнічний інститут імені Ігоря Сікорського»,
кафедра відновлюваних джерел енергії, просп. Перемоги,
37, м. Київ, 03056, Україна,
тел./факс: +38(097)-321-18-04, e-mail: bonduro@gmail.com*

У статті представлені основні ідеї оцінки кількісних показників ризику експлуатації електроенергетичних систем при відмовах окремих підсистем з відповідальними споживачами. Запропоновано при оцінці режимної надійності ЕЕС використовувати інтегральний індекс ризику функціонування.

Ключові слова: надійність, електроенергетична система, відмови.

ORCID: 10000-0002-5776-1500.

There is a steady tendency to increase the accident rate in the electric power systems of Ukraine and other industrialized countries. Three main factors affect the reliability of the electric power system (EPS): aging and exhaustion of the resource of electrical equipment, adverse degradation climatic conditions, and electricity liberalization. Depreciation of electrical equipment is currently a major problem of energy sector, the solution of which depends on the reliability of its operation [1].

In electric power industry, the economic responsibility of energy companies for disrupting the normal regime of the EPS is increasing. For this reason, energy companies are interested in ensuring reliable operation of the power supply system. Market pressure, competition, cost savings and lower reserves are at the heart of this interest. These factors affect the reliability of the equipment [1-3].

The above factors increase the risk of an accident in the power system with a disruption of electricity supply of consumers, which is confirmed by statistical analysis of the accidents at electric power systems of Ukraine. Accidents

arising from disruptions of electrical equipment lead to a violation of the dynamic stability of electric power systems and cascading failure, and, as a consequence, to the disruption of technological processes of consumers with major losses.

Decision-making to ensure reliable operation of the EPS requires a complex approach that takes into account the significant factors: the probability of electrical equipment failures; economic and environmental impacts; incompleteness and obscurity of information.

Global trends in the development of methods for ensuring the reliability of the EPS indicate the increasing role of risk management in management decisions [1-2]. The application of risk management strategy in the management of the EPS requires the use of risk as an integral indicator of the reliability of the EPS.

Therefore, there is a need to take into account and evaluate all the risks of operating electric power systems, in particular in case of disruption of electrical equipment.

Mathematical and program software [4] was used to determine the integral risk index of the operational reliability of the complex EPS in case of failures of load with responsible consumers. A fuzzy mathematical model was used for aggregated estimation of the EPS risk index in the case of failures of individual subsystems. Quantitative characteristics of the risk of operating the EPS in case of failures of load units with responsible consumers were obtained for test scheme. The results confirm the effectiveness of the approach in solving management problems and making decisions to ensure regime reliability.

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