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Brynda Vladyslav,
teacher of English language department, IFNTUOG.
Baran Bogdana
Ivano-Frankivsk Professional College of Lviv National University of Environmental Management

COMPREHENSIVE ASSESSMENT AND OPTIMIZATION OF RADIATION RISK MANAGEMENT SYSTEMS

The relevance of the research of radiation control problems is due to an extremely difficult situation in the field of technogenic safety and requires deep scientific understanding. Despite significant progress in nuclear security technologies, radiation pollution risks continue to be a critical problem with today. The world experience convincingly demonstrates the potential destructive power of radiation incidents, with vivid examples of tragic crashes at the Chernobyl NPP and Fukushima [2,6].

The modern global environment is characterized by a number of challenges that further increase the importance of research in the field of radiation safety. These include the continuation of the outdated nuclear power plants with significant physical and moral wear of the equipment. The spread of nuclear technologies in different countries of the world creates additional prerequisites for potential radiation risks. The potential risks of man -made and natural disasters are particularly alarming, which can have unpredictable effects on environmental safety.

Equally important are the threats associated with possible military conflicts that can instantly turn nuclear objects into sources of global danger. Climate changes further complicate the situation, affecting the stability of man -made objects due to the increase in the frequency of extreme natural phenomena [2,7].

The problem of radiation control is of particular severity in modern conditions. The constant technological complication of nuclear objects requires increasingly sophisticated and accurate monitoring methods. At the same time, the increase in the population density around the potentially dangerous areas of Multiplik is possible for human health. The situation is complicated by insufficient funding for radiation monitoring systems, which prevents the most modern control and diagnosis technologies [1,5].

A critical problem is the lack of high -professional personnel in the field of radiation safety. This not only complicates current monitoring, but also creates long -term risks to ensure man -made safety. The scientific novelty of the presented study is to develop a comprehensive approach to radiation risks assessment. This approach integrates the most modern scientific methodologies and tools. In particular, research is based on the use of modern mathematical risk assessment models that allow you to predict potential dangers as accurately as possible [2,8].

Methodology of multifactorial analysis proposed in the work provides a comprehensive study of radiation risks, taking into account a wide range of variables. Innovative approaches to radiation monitoring developed in the study are

a fundamentally new look at the radiation safety system. They take into account the modern technological capabilities and severity of existing challenges, offering more efficient mechanisms for control and management of radiation risks [3,5].

The purpose of the study is to comprehensively and comprehensively study the theoretical and practical aspects of radiation control. The study had several key tasks: first, to make a thorough analysis of the methods of assessing radiation risks to the health of the population; secondly, to develop innovative approaches to optimization of radiation monitoring systems; Third, to offer effective methods of minimizing the negative impact of radiation pollution [1,7].

The research methodology is based on the use of two fundamental types of risk analysis. Qualitative analysis is the first level of study and is fundamentally important for the initial assessment of the situation. It provides a thorough analysis of the structure, factors and circumstances that can lead to risky situations. This approach is based on professional knowledge, many years of experience and intuition of radiation safety professionals. The purpose of qualitative analysis is to identify potential sources of danger, identify priority areas of further study and preliminary assessment of the possible consequences of radiation impact. The second key element of methodology is a quantitative analysis that provides accurate mathematical and statistical risk assessment. This approach allows you to transform qualitative observations into specific numerical indicators that are crucial for making sound management decisions. Quantitative analysis includes the use of complex mathematical models, statistical methods, simulation methods and expert assessments.

One of the most important results of the study was the methodology of calculating the average daily dose of radiation pollution developed by scientists. The technique takes into account a wide range of factors, in particular the concentration of radioactive substances in the air inside and outside the premises, the time of stay in different environments, respiratory rate, exposure frequency and other parameters [2,6].

The study proposed a comprehensive system of formulas for calculating key radiation risk indicators. In particular, the method of calculating the hazard (HQ) is developed, which allows to quantify the potential harm to health from radiation. The concept of the hazard index (HI) is introduced, which characterizes the aggregate risk from the influence of various radiation factors. A fundamentally important element of the study was the calculation of individual and population carcinogenic risk. Individual risk allows you to assess the likelihood of cancer for a particular person as a result of radiation. Population risk makes it possible to predict the potential effects of radiation pollution for the entire population [2,9].

The practical implementation of the methodology was demonstrated on the example of a city with a population of 545 thousand people. The results of the calculations found that the level of radiation risk is low and acceptable, which fully meets the criteria of the World Health Organization (WHO) for a minimum level of risk. The study proposed an integrated approach to optimizing radiation control systems. This approach involves improving the methods of early detection of

radiation risks, developing effective strategies for forecasting and response to potential radiation accidents [1,10].

The practical importance of work is fundamental and multi -vector, covering a wide range of directions of application of scientific results. The methods developed in the study are a powerful toolkit for complex improvement of the radiation safety system. The prospect of updating the regulatory framework in the field of radiation safety is one of the key practical results of the study. The proposed scientific approaches allow you to significantly update existing regulatory documents, making them more accurate, scientifically sound and adapted to modern technological realities. This is especially important in the conditions of constant technological development of the nuclear industry and changes in the nature of potential radiation risks [4,9].

An important practical area is the training of staff involved in radiation monitoring systems. The developed techniques and approaches can be directly introduced into the professional training and retraining system of specialists. This will significantly increase the level of professional competencies, provide a deeper understanding of modern methods of assessing radiation risks and algorithms for action in potentially dangerous situations [3,8].

A significant contribution of research is the improvement of existing emergency planning systems. The proposed scientific approaches make it possible to develop more accurate, detailed and effective plans to respond to possible radiation incidents. This includes both improving preventive measures and optimization of action algorithms in the event of emergencies. A fundamentally important practical result is developed methods of reducing the risks of radiation pollution. The research offers a comprehensive approach to the identification, evaluation and minimization of potential radiation threats. This not only allows you to predict the possible risks more accurately, but also to develop effective strategies for their prevention and neutralization [2,5].

Ensuring a higher level of environmental safety is the end -to -end purpose of the work presented. The proposed techniques go beyond a highly specialized approach, offering a systematic vision of environmental safety in the context of radiation risks. This applies to both nuclear objects and adjacent areas, ecosystems and settlements. The results are extremely widely practical for the further development of radiation control systems. They can be successfully applied in various fields related to potential radiation. These include nuclear power, medicine, research, industry that uses radioactive materials and other areas.

The uniqueness of the study lies in its interdisciplinary nature. The proposed techniques and approaches can be adapted and integrated into various risk management systems, which makes them useful not only for highly specialized specialists, but also for a wide range of persons responsible for making technogenic and environmental safety decisions.

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Diviziniuk M.M.
Dr. Phys.-Math. Sci., Professor, Center for Information-analytical and Technical Support of Nuclear Power Facilities Monitoring of the NAS of Ukraine
Farrakhov O.V.
Cand. Sc. (Tech.), Senior Research Fellow, Center for Information-analytical and Technical Support of Nuclear Power Facilities Monitoring of the NAS of Ukraine
Kovach V.O.
D.Sc. in Public Administration, Professor, Center for Information-analytical and Technical Support of Nuclear Power Facilities Monitoring of the NAS of Ukraine
Zaitsev Ie.O.
D.Sc. (Tech.), Senior Research Fellow, Center for Information-analytical and Technical Support of Nuclear Power Facilities Monitoring of the NAS of Ukraine

REGULARITIES OF THE PROCESS OF TARGET DETECTION BY PULSE RADAR STATIONS

The protection and defence of the state’s critical infrastructure against various types of terrorist threats is an integral part of Ukraine's national security. These facilities include nuclear, thermal and hydroelectric power plants, mining