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Adaptability of technologies for regulation and analysis of nuclear and radiation safety in Belarus

Content

1. Planning the directions of regulatory areas.
There is planning to define in order to realize the key elements for analysis, oversee, testing for NPP' equipment and systems during NPP operation stages and control of ageing and obsolescence to operate safely and reliably, and radioactive waste management activities. Separate directions are the development of aging and obsolescence control programs, the specification and development of measures and procedures for the safe management of radioactive waste and spent nuclear fuel.
2. Flexibility of regulation, supervision and licensing of activities. Systematization of the safety analysis of complex systems.
The main stream for NPP life management will realized and started from basic regulation requirements. The real and fact conditions will issued according to the practice related to referent equipment and systems and NPP units, recommendations of NPP producer. The period of license issuing is based on comprehensive safety reviewing and *NPP configuration* analysis.
3. Aspects of nuclear and radiation safety regulation, impact on management systems and man-to-man, man-to-machine systems.
It is necessary to proceed from the concept of the human factor in the interpretation used in engineering psychology. In its analysis, the main focus should be on improving the emergency resilience of the operator or its services. Insufficient qualification and low discipline of management and staff, deficiencies in logistics, moral and technical deterioration of equipment and errors in the design of nuclear installations are the cause of accidents.
When predicting the influence of the human factor, the adequacy of the degree of responsibility of decision-making by specialists of new (beginner) operator to possible consequences should be taken into account.
The assessment of operator concerning of leadership, management system and safety culture should be based on a comprehensive analysis of the results of inspections, the quality of documents to be sent to the regulator and the degree of their preliminary study, the timeliness of compliance with regulatory requirements and regulations, the depth of the study of safety issues in the framework of the implementation of modifications at the NPP and the development of corrective measures, the timeliness of informing the regulatory body about important for safety topics, the results of interactions within the framework of various discussions on these issues, the implementation by the operator of measures to achieve the goals and objectives of the safety and security policy, etc.
4. Analysis of safety indicators of nuclear installations. Approaches and models of robust data analysis.
In the course of regulatory activities, it is necessary to determine the priority and frequency of supervisory activities, to make emphasis on paying attention to various systems and equipment, to determine the critical condition of equipment or systems, as well as to be able to determine the precursors of incidents and accidents.
There are three categories of robust mathematical analysis for the research plans in order to apply it sequentially and (or) in parallel: *quantitative analysis, graph theory, BIG DATA analysis theory.*
Regulatory and operational documents contain lists of established safety indicators of nuclear installations (physical quantities, probabilities, risks). The indicators make up the data array A0(1..N0). Indicators are *the initial parameters* for differentiated safety analysis in data systems for which the analysis is carried out: belonging to systems and equipment, safety classes, groups of equipment systems, frequency of monitoring indicators, consequences of changes in the level of safety, classification of the severity of violations, etc.. Other data consists of arrays A(1..N1), B(1..N2).. ZZ(1..ZZ).
For quantitative analysis, the values of the indicators are compared. When applying graph theory, graphs with vertices A0(1..N0), A(1..N1), B(1..N2).. ZZ(1..NZZ) are constructed. The parameters of graphs are determined (the number of vertices and connections, the valence of vertices, etc.), the change in graph parameters, the presence of extremes are analyzed, critical systems and their complexity are determined, and a conclusion is made about priority regulatory actions. When accumulating a large array of empirical and calculated data, approaches of the theory of BIG DATA analysis are used.

The result of the analytical work carried out will be an information directory with up-to-date information that can be used when making *regulatory decisions*, *visualization of regulation*.

5. Development of a comprehensive training system for expert personnel.

The main role for successful promotion of NPP longtime management program depends on training, ageing of NPP and regulatory staff, knowledge lacks. Strategically, as target and key direction of the NPP life management program, the conservation of knowledge and experience management should be provided and accumulated in training centers under supervision of high skilled tutors which have large experience in regulation and (or) NPP operation.

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