

STATUS OF NUCLEAR SAFETY CULTURE THROUGH LESSONS LEARNT FROM LICENSING, PERIODIC SAFETY REVIEW AND RELICENSING OF ACTIVITIES AT NUCLEAR RESEARCH INSTALLATIONS IN RUSSIAN FEDERATION

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Abstract

Russian Federation (Russia) has a lot of Nuclear Research Installations (NRIs)¹ of various types and powers for the fundamental and applied sciences in the field of physics, power engineering, material study, biology and medicine. The work is being carried out to optimize the Russian fleet of NRIs, depending on the science and atomic energy needs. Due to the reduction of NRIs in operation in the world the experimental abilities of Russian NRIs as well as their safety conditions, to be in compliance with up-to-date safety requirements, represent the certain interest both to European region and international collaboration as a whole. The effective system for safety regulation in the field of atomic energy use has been established at present in Russia and is being improved. The legal basis and principles of regulation of relations arising in atomic energy use have been put in force at the state level taking into consideration fundamental principles of nuclear law adopted in practice worldwide. The report outlines the results and lessons learnt from licensing of NRIs in Russia as a continuous process having a few stages during the lifetime of a NRI. Enhancement of nuclear and radiation safety and security of NRIs in operation is pointed out at the initial licensing stage in the past, when no sound technical requirements and reference licensing basis were available, and then as a result of further safety evaluations and re-licensing. Through lessons learnt from licensing of NRIs the principal findings are summarized on the safety status of NRIs in Russia and further evaluation of their safety. A sound legal framework, well arranged licensing process and supervision, also scientific and technical support and other advisory organizations can help enhance nuclear safety culture because the activities at NRIs include various aspects related to safety: legal, administrative, technical, economical, ecological, informational, social and even psychological. There exist a few examples of a good practice of licensing of activities at NRIs in Russia: independent expert and inspection resources are available for the regulatory body, improvement of quality management system of operating organizations for a particular research reactor and associated experimental facilities, decrease of number of reportable incidents at NRIs and non-compliances with safety requirements, a progress in the safety issues of decommissioning of NRIs, enhancement of efficiency of information exchange system.

1. INTRODUCTION

Licensing of activities related to nuclear facilities is one of the principal functions of safety regulation of atomic energy use. The licensing process stipulates conditions for regulatory control to provide proper level of safety and security of nuclear and radiation hazardous facilities within countries of various nuclear programmes and resources. The licensing of activities should provide management system that integrates safety, security, health, environmental, quality and economic elements [1]. Lessons to be learnt from experience of licensing and expert reviews represent important tool for continuing promotion of an effective safety and security culture. Fukushima-Daiichi NPP accident in March 2011 highlights the need to consider new challenges in atomic energy use and improvement of nuclear management and regulatory functions efficiency. The summary of development, results and lessons learnt from the licensing of NRIs in Russian Federation are presented below.

¹ NRIs - structures and complexes with research nuclear reactors (RR), critical (CA) and subcritical (SCA) nuclear assemblies that have been designed for utilization of neutrons and ionizing radiation for research purposes.

2. THE PROGRESS STAGES OF REGULATORY REGIME IN RUSSIAN FEDERATION.

Established in 1983 year the USSR State Committee on Supervision of Nuclear Power Safety was the first authority in the country that commenced on the development of national infrastructure for safety regulation in the field of the use of nuclear energy. Before this time nuclear and radiation safety of all NRIs as well as other facilities of atomic energy use were under departmental supervision of specific Ministry of the USSR that was responsible for promotion of nuclear programme. According to the order of the President of Russian Federation (1991) all facilities of atomic energy use within the territory of Russian Federation despite of their nature and ministerial/departmental ownership have been handed over to the state supervision of the State Committee for Supervision of Nuclear and Radiation Safety, which was then renamed to Federal Nuclear and Radiation Safety Authority of Russia - RF Gosatomnadzor (GAN). This authority was responsible for the development of regulatory framework and implementation of safety regulation of atomic energy, nuclear materials and radioactive substances in peaceful and defense purposes within the territory of Russian Federation. In the middle of 1993 the RF Gosatomnadzor developed the temporary permits² for activities in the field of atomic energy use for the operating time of 1-3 years until the Federal Law on the Atomic Energy Use has been developed, adopted and put in forth. The major purpose of the temporary permits was to backfit the NRIs to the compliance with safety requirements established by RF Gosatomnadzor. In 1995 the Federal Law on the Atomic Energy Use was put in force, and in 1997 the Licensing Regulations Governing the Atomic Energy Use were approved by Decree of the Government of the RF. The legal basis and principles of regulation of relations arising from atomic energy use have been established at the legislative level in line with fundamental principles of up-to-day nuclear laws accepted by international practice [2, 3]. The key points of the licensing process at the initial stage were the following: 1) to specify the list of licensed activities at NRIs; 2) to define the scope of kind of licensed activity; 3) to establish optimal period of licence validity for specific kind of activity taking into account the current state of the facility and its hazard potential.

At the stage of initial licences the following effects were achieved in improvement of regulatory regime and enhancement of nuclear and radiation safety of the atomic energy use in line with international obligations of Russian Federation and the IAEA recommendations:

- The set of Federal Norms and Rules in the Field of Atomic Energy Use (FNR) was formed as a reference level for expert's review, oversight and safety assessment of nuclear facilities and kind of activities;
- The administrative procedures for licensing of activities in the field of atomic energy use and the list of documents needed to be considered at each stage of the lifetime of NRI (design, commissioning, operation, decommissioning) have been established;
- In accordance with requirements of FNR the major safety documents including Safety Assessment Report, Quality Assurance Programme, Emergency Plan, documents on Nuclear Materials Control and Accounting, Physical Protection, and also operation documents including Engineering Procedures (Technical Specification), Operating Instructions have been refreshed or developed newly at all licensed NRIs;
- The appropriate State Agencies managing atomic energy use approved operators/operating organizations as being suitable to operate a nuclear installation,

² Temporary permit – official document issued by RF Gosatomnadzor to authorize competence of organization (enterprise) and confirming the right to carry out a specified type of activity and provide services in the sphere of the use of atomic energy provided that the safety of the object concerned with the use of atomic energy and of activities carried out is ensured.

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radiation source or storage facility by themselves or with the involvement of other organizations. These organizations shall be able to carry out activity related to the location, design, construction, operation and decommissioning of a nuclear installation, radiation source or storage facility as well as the activity connected with handling of nuclear materials, radioactive substances and radioactive waste;

- The measures for safety enhancement have been carried out at the most of NRIs to provide validity period of operation license more than three years;
- In some cases the decision of final shutdown of NRI and subsequent decommissioning plan have been taken, when safety review and inspection of operation licensing conditions (OLCs) fulfillment had shown that further safely operation of the facility would not be possible and modification of NRI would not be economically expedient.

In fact after 2000 all NRIs were relicensed. The main lessons learnt from initial licensing of NRIs showed the need to enhance efficiency of safety regulation and first of all the following issues: accounting of nuclear material, radioactive substances and radioactive waste; their physical protection; emergency planning; quality assurance programme; ageing management programme.

Ageing of structures, systems and components important to safety (SSC) is a topical issue for the majority of the NRIs, which have been in continuous operation for the period of time exceeding the design operating time. There is no a special regulatory document that would formulate requirements for NRIs ageing management programme. But in 2000 the FNR "Requirements for Justification of Possible Extension of Assigned Operating Life of Facilities Using Nuclear Energy, NP-024-2000" was developed, which includes the requirement for the operating organization to implement the management programme of SSCs service life. When facility operating life has not reached the established design operating time or was being in operation less than 30 years, the oversight for ageing shall be performed by inspection to check compliance with the licence conditions and by further relicensing. When prescribed operating life of NRI is expired (or reached 30 years term), the operator shall assess the possibility to extend operation of the facility and carry out the following arrangements:

- Comprehensive survey of NRI;
- Definition and justification of residual service life time of SSC;
- Arrangement for NRI to operate safely during extended operating time including:
 - Additional research to define residual service life time of SSC;
 - Replacement of overage equipment and, if necessary, its modernization;
 - Testing of SSC to the compliance with design requirements;
 - Correction of documents justifying safety.

Evaluation of potential accidents at NRI is one of the major issues of expert review of safety. In line with the requirements of the FNR "General Provisions for Nuclear Research Installations Safety (NP-033-01/10)" the design of NRI shall contain a list of initiating events for the design basis accidents (DBAs), a list of beyond design basis accidents (BDBAs), assessment of an accident probability and its sequence. The operating organization using deterministic analysis of defense in depth concept shall justify chosen list of initiating events, possible ways of accident progression and radiation consequences. The requirements to analyses of DBAs and BDBAs have been established in the FNR "Requirements to Contents of Safety Assessment Report for NRIs (NP-049-03)". In line with the requirements of NP-049-03 it shall be justified in SAR that all external impacts peculiar to area of NRI location and having potential frequency 10^{-6} per year and more have been taken into consideration in the design ground. The limits established by the FNR "Radiation Safety Codes, NRB-

99/2009” restrict radiation dose rate to personnel, public and impact to environment during operation and accidents. The basic dose limits for normal operation of NRI are followings: occupational dose limit is 20 mSv/a in average for any consecutive 5 years but annually not more 50 mSv, public dose limit is 1 mSv/a in average for any consecutive 5 years but annually not more 5 mSv. In case of accident the intervention level for urgent protective actions for public: sheltering - 5 mSv, evacuation - 50 mSv.

To develop probabilistic safety analysis in addition to deterministic approach the following probabilistic criteria are established in the FNR “Nuclear Safety Rules for Research Reactors, NP-009-04” and the FNR NP-033-01/10 accordingly:

- Probability of the reactor core melting shall not exceed 10^{-5} 1/a;
- Probability of extreme radioactivity release requiring decision for public protection including evacuation shall not exceed 10^{-7} 1/a per facility.

A definition of radiation source term for BDBAs is one of the crucial issues for licensing of NRI. Reasonably accurate source term calculations and analysis of their consequences are very important issue for overall identification of appropriate accident management strategies, development of emergency response plans and mitigation measures (particularly given that many research reactors are located in fairly densely populated areas). The need to assess the source term is particularly important in the case of new fuels or recently qualified fuels for research reactors.

3. PRINCIPAL FUNCTIONS OF SAFETY REGULATION OF ATOMIC ENERGY USE IN RUSSIAN FEDERATION.

Numerous administrative mechanisms of safety regulations are being applied to nuclear facilities in Russian Federation:

- State expert review of design documentation of capital constructions and site engineering survey;
- State ecology expert review of the design documentation;
- Granting permit to build, reconstruct, major repair, and decommissioning;
- State supervision (building, electrical, fire, industrial, radiation, nuclear);
- Licensing of activities and services;
- Certification, acceptance testing of equipment and systems (before their operation);
- Insurance of losses and damage caused by radiation exposure;
- Qualification of personnel;
- Granting permits to personnel for the activities related to the atomic energy use.

The Government of Russian Federation has established State Authorities within the regulatory framework of atomic energy use. Activity of these authorities and their powers, rights, obligations and responsibilities for regulation of nuclear, radiation, industrial and fire safety are determined by the relevant provisions adopted by the Government of Russian Federation.

As a result of administrative reform of governmental system and under decree of the President of Russian Federation the Federal Environmental, Industrial and Nuclear Supervision Service of Russia (Rostekhnadzor) was established in 2004 by transforming the Federal Industrial Supervision Service and the Federal Nuclear Supervision Service (former RF Gosatomnadzor) into Rostekhnadzor, governed by the Government of the Russian Federation. Rostekhnadzor is a federal executive body, which exercises the functions on state policy formulation and legal regulation of safety in the field of atomic energy use (except of the activities on development, production, testing, operation and decommissioning of nuclear

weapons and military nuclear power installations), and is in charge of environmental, industrial and nuclear safety supervision. Rostekhnadzor structure includes 2 Department of Headquarters for safety regulation in the field of atomic energy use, 7 Interregional Territorial Departments for Nuclear and Radiation Safety Supervision (ITD Rostekhnadzor), technical support organization Scientific and Engineering Center for Nuclear and Radiation Safety (SEC NRS). The principal functions of nuclear and radiation safety regulation are as following: 1) Development and implementation of FNR in the field of nuclear energy use (regulatory control); 2) Licensing of activities and services in the field of atomic energy use (licensing); 3) Supervision of safety of nuclear facilities, including nuclear material accounting and control and their physical protection (supervision).

The Russian Federation legislative and regulatory structure of documents in the field of atomic energy use is given in the list [4]. In the structure of documents three levels of hierarchy shall be emphasized: 1) Legislative Acts of the Russian Federation; 2) Regulatory Documents of Rostekhnadzor; 3) Recommendation Documents.

The set of FNR for safety of NRIs is based on the fundamental safety principles and takes into consideration specific features of NRIs. Structure of FNR in the sphere of atomic energy use includes two levels of documents pertaining to the regulatory requirements:

- General provisions for safety ensuring of each type of the facilities using atomic energy (Nuclear Power Plant - NPP, Nuclear Research Installation - NRI, Nuclear Installation on Ships - NIS, Nuclear Fuel Cycle Facility - NCF, Radioactive Sources - RS);
- Regulatory documents pertaining to types of activity:
 - Common for all types of nuclear facilities including account of external impact, radwastes handling, account and control of nuclear materials, radioactive substances, radwastes, physical protection;
 - Specific requirements for each nuclear facilities (NPP, NRI, NIS, NCF, RS) including quality assurance, sitting, design, safety justification, commissioning, operation, emergency preparedness, decommissioning.

Taking into account the results of initial licensing the set of FNR has been improved by common safety requirements to control and accounting of nuclear materials (NP-030-2005), to control and accounting of radioactive substances and radioactive waste (NP-067-2005), physical protection of nuclear facilities and nuclear materials (NP-083-07), and requirements to implement the management programme of SSCs service life (NP-024-2000). The graded approach is reflected in FNR considering the scope of safety requirements appropriated to the magnitude and the nature of the hazard and the risk posed by the NRI. The following two clarification of safety requirements are used in FNR: 1) by type of NRI (different rules on nuclear safety), 2) by level of potential radiation hazard of the facility (four classes used). To further enhance the regulatory efficiency a few new regulations are being developed now including Requirements for Periodic Safety Review of Nuclear Research Installation and Release of Nuclear Research Installation Site from Regulatory Control.

The legislative infrastructure and reference basis for safety regulation of NRIs in Russian Federation have not any contradiction with recommendations of the Code of Conduct on the Safety of Research Reactors. Some Code's recommendations have not been implemented in the full scope and are in satisfactory progress now [5]. The team of Integrated Regulatory Review Service mission in 2009 noted that the framework for safety regulation in the Russian Federation is comprehensive enough. Outcomes of mission have been issued in the report [6].

4. ADMINISTRATIVE LICENSING PROCEDURES IN THE FIELD OF THE USE OF NUCLEAR ENERGY.

The licensing of activities at all stages of NRI lifetime is being carried out on the basis of Federal Law on the Use of Atomic Energy (1995), in accordance with Licensing Regulations Governing the Use of Atomic Energy, approved by Decree of the Government of the RF (1997), and Administrative Regulation to Perform the State Function of Licensing Activity in the Field of Atomic Energy Use by the Federal Environmental, Industrial and Nuclear Supervision Service (further- Administrative Regulation), put in forth by order of the Ministry of Natural Resources and Environment of Russian Federation (2008). The legislative acts related to Rostekhnadzor state function of licensing are available at the Web-side portal www.gosnadzor.ru.

Licences³ shall be issued to operators of facilities and to providers of labor and services relating to atomic energy use ("applicants"). No activity of any sort in the sphere of atomic energy use, which has to be licensed by regulatory authorities, may be carried out unless a license for it has been obtained. In general, the Russian licensing procedures and principles correspond to IAEA recommendations [7]. The licensing process includes the following administrative procedures:

- Examination of the license application and a preliminary check of the accompanying documentation;
- Review, including expert review of safety relevant documents and, if needed, inspection to confirm reliability of submitted documents;
- Decision-making to issue or refuse the license;
- Grant of a license and specification of its terms and conditions (specific obligations) for performance;
- Follow-up procedures including inspection to check compliance with the licensing conditions;
- License conditions correction or amendment during the activity;
- Extension, suspension or termination (cancellation) the license.

The list of activities in the sphere of atomic energy use, which require a licence to be obtained, and the order for granting and expiration of such licences, is established by the Government of Russian Federation. To obtain a licence an applicant shall submit to Rostekhnadzor or to its regional office authorized for licensing of specific activities the licence application and the accompanying documents including set of documents confirming the nuclear and radiation safety of the NRI, accounting and control of nuclear materials, radioactive substances and radioactive waste, and their physical protection. The detailed list of documents confirming the safety is specified in the Administrative Regulation, being dependent on the kind of activity and kind of facility of atomic energy use.

During the administrative procedure of reviewing of submitted documents Rostekhnadzor shall arrange verification of the information they contain, expert review of the documentation confirming the nuclear and radiation safety of activity, carry out, if necessary, inspection of the operator, and applicant works needed to eliminate any shortcomings identified. The expert review of the documentation confirming the nuclear and radiation safety of the NRI shall be carried out within a contract of applicant with chosen by applicant an expert organization. An expert organization shall possess a proper licence of

³ In the Federal Law on the Use of Nuclear Energy, a permit (licence) granting the right to carry out activities in the sphere of the use of atomic energy is understood as a duly issued official document confirming the right to carry out a specified type of activity, if the safety of the objects using atomic energy and the safety of carried out activities are ensured.

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Rostechnadzor to perform the examination. The list of expert organizations, which have licence of Rostechnadzor to perform expert review of safety demonstration documents is available at Rostechnadzor Web-side portal www.gosnadzor.ru. The subject-matter of expert review, number of tasks (“safety factors”) to review, and its duration are dependent on the kind of activity and results of compliance with licence conditions that had been issued before. The main issues for expert review are as following: General description of the facility, Safety principles and criteria, Characteristics of the site, Structures, systems and components, important to safety (SSC), Results of works carried out to justify possibility to extend service life of SSC (for ageing NRI), Accident safety analysis (DBA and BDBA), Limits and conditions of safe operation (OLCs), Nuclear Safety (core management), Radiation safety (personnel, public, monitoring), Fuel, radiation material and radwaste accounting, Facility, fuel and radiation material physical protection, Industrial safety (pressure vessels, lifting devices), Emergency preparedness (personnel and the public), accident mitigation measures, Fire protection, Quality Assurance, Decommissioning. The duration of expert review shall be established on the basis of applied graded approach, kind of activity and grade of NRI potential radiation hazard. For example, the maximum period of expert review for research reactors and critical assemblies is 10 months, for subcritical assemblies – 6 months. The expert organization draws up the outcomes and findings of expert review in the expert report regarding nuclear and radiation safety of the NRI. Rostechnadzor may discuss the expert report at the Consulting Meeting of Rostechnadzor’s Research and Technology Advisory Council for comprehensive discussion of NRI safety issues respective to international standards and analogues.

Inspection of the operator is carried out in case of necessity. In the following cases inspection shall not be carried out:

- Applicant possessed the licence for the activity and during this period of time there have not been discovered any violations of licence conditions;
- Inspection has been done earlier without any remarks but applicant had got refusal in granting a licence as a result of expert review and then applied for a licence for the second time;
- Information about the applicant was changed (changing of title, kind of ownership, assignee ect.), but nuclear facility has not been changed;
- The applicant had got refusal in granting a licence as a result of inspection but for second time applied for a licence and included full information justifying that all safety deficiencies discovered before had been eliminated;

In all other cases the inspection is obligatory.

The decision to grant or refuse a licence shall be made by authorized senior officials of Rosatomnadzor on the results of verification of accompanying documents, the expert review of the documents confirming the nuclear and radiation safety of the nuclear facility and/or applied activity and results of inspection, if it was carried out. Applicant can receive the licence after payment of the licence granting fee.

The licence conditions shall form an integral part of the licence. They shall include Rostechnadzor's requirements concerning the safety of the licensed activity, based on its specific nature. General requirements to structure and contents of licence conditions were included in Administrative Regulation. The licence conditions shall not include restrictions of activity, which were not established in the Federal Legislation and Legislative Acts of Russian Federation in the field of atomic energy use.

Rostechnadzor may deprive the licensee of the right to continue the licensed activity by suspending or canceling the licence. The legal grounds to suspend the licence are as following:

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- Violation by licensee the Federal Legislation and other Legislative Acts of the Russian Federation in the field of the use of nuclear energy;
- Violation by licensee the licence conditions;
- Nonfeasance by licensee the prescriptions of the regulatory body;
- Expiry date of the document concerning approval of the organization as being suitable to operate a nuclear installation, radiation source or storage facility.

The legal ground to cancel the licence is licensee incapacity to eliminate infringement that has entailed suspending the licence.

5. PERIODIC SAFETY REVIEW AND OPERATOR'S ANNUAL REPORT ON SAFETY STATUS OF NRI.

Specific requirements to carry out periodic safety review have not been established in FNR till now. But practically safety review of NRIs is being performed every five years. In Rostechnadzor's practice the licence for the kind of activity is issued for a five year period and on expiry of this period of time the operating organization shall obtain a new licence. During a new licensing process the operating organization shall submit a safety justification of NRI operation including updated safety analysis report. In relicensing the expert review of documents confirming the nuclear and radiation safety of the NRI shall be carried out taking into account complexity and radiation risk of the NRI. Facing the facts that Federal Law on the Atomic Energy Use does not limit the term of licence validity and also a trend is being observed to extend period of operation licence validity more than for five year period, the draft of regulations on NRI periodic safety review was developed in 2011 and will be completed in 2012.

Based on licence conditions an operating organization is obliged to submit to Rostechnadzor the annual report on status of nuclear and radiation safety of managed NRI in accordance with recommendations of the safety guide "Contents of the Operating Organization's Annual Report on Status of Nuclear and Radiation Safety at NRIs, RB-025-03". The report shall include information about fulfillment of licence conditions, data on technical state of SSC, ageing management programme, quality assurance programme, state of physical barriers, abnormal events occurrence reporting, carried out emergency training and other information concerning safety of NRI. The annual report shall be reviewed independently by appropriate ITD Rostechnadzor, SEC NRS and Headquarters of Rostechnadzor, Department for Safety Regulation of Nuclear Power Plants and Nuclear Research Facilities. The results of review of annual reports are being applied in planning of the following Rostechnadzor activities:

- Inspections of nuclear and radiation safety at NRI, control and accounting of nuclear materials, radioactive substances and radioactive waste, their physical protection;
- Correction or amendment of licence conditions;
- Improvement of safety standards (FNR), regulations and guides. Reviewing of annual reports is an effective tool to check compliance of licensee activity with licence conditions and accountability for safety.

6. CURRENT STATE OF SAFETY OF NRI IN RUSSIAN FEDERATION.

At present Rostechnadzor conducts the state safety regulation and supervision at 70 civil NRIs operated by 19 organizations that are managed by different state agencies. The utilization factor of the most powerful RRs is in the range 0,5-0,9. The data on NRIs safety status is published in annual Rostechnadzor report [8]. All mentioned NRIs are licenced,

personnel qualified and has got Rostekhnadzor's permits for rights of activity. The general key indicators of NRIs safety status are listed below:

- Airborne releases and liquid emissions of radioactive substances are essentially less than permissible limits of effluents and less than the reference levels established by operating organizations to control radiation trend;
- The radiation dose rate to staff of NRIs and attracted workers essentially less than reference and permissible levels established by FNR "Radiation Safety Codes, NRB-99/2009". Depending on the kind of facility and occupational category of staff the individual dose of radiation exposure in average is from 2 mSv to 15 mSv per year whereas the upper regulatory limit is 20 mSv/a, being 50 mSv in a particular year averaged to 20 mSv/a for a 5 year period;
- Happened incidents at NRIs had not result in personnel exposure exceeding permissible levels or contamination of environment beyond prescribed limits. Event analysis since 1991 till now clarified tendency of decreasing of total number of incidents at NRIs thus in 1991 53 events were reported, in 2010 – 10, in 2011 – 8 events, maximum number of events happened in 1995–89 events;
- All supervised NRIs have emergency plans in line with the requirements of FNR "Requirements to the Content of Plans of Actions for Personnel Protection in Case of an Accident at Research Nuclear Installations, NP-075-06". The personnel training on emergency preparedness is being conducted on a regular basis. In frame of technical cooperation with IAEA the activity is performed on national project "Strengthening Emergency Preparedness and Response at Nuclear Research Facilities" (RUS/9/005);
- Physical protection of NRIs, nuclear materials, radioactive substances and radwaste is in line with Legislative Acts of the Russian Federation and requirements of FNR. All licensees and competent authorities concerned possess the means and have contingency plans to respond to unauthorized removal or theft of nuclear material or sabotage at nuclear facilities or attempts thereof.

As a result of licensing, inspection checks of compliance with the licence conditions, expert reviews and reviews of operating organizations' annual reports Rostekhnadzor estimates the current status of safety and security at NRIs as satisfactory. Nevertheless, stressing the importance of preliminary lessons learned from Fukushima-Daiichi NPP accident it was arranged the additional goal reviews of safety of Russian NRIs regarding to possible extreme external events, which could be those of potential resultant severe BDBA.

7. THE OUTCOMES AND LESSONS LEARNT FROM RELICENSING OF NRIS IN RUSSIAN FEDERATION

The general outcomes of relicensing of NRIs and activities in the field of atomic energy use in Russian Federation include the following:

- Methodology of safe termination of activity, decommissioning and release of facility from regulatory control have been provided;
- Procedures of granting of permits to personnel for activities has been established;
- The number of disturbances at NRIs decreased;
- Interdepartmental information exchange has been improved.

The major lessons learnt from relicensing of NRIs since 2000 till now consist of necessity of the following: 1) strengthening of the state management system and system of safety regulation of atomic energy use on the legislative basis, 2) improvement of the management systems of organizations in a way that permits and promotes the development of a strong

safety culture together with the achievement of high levels of safety performance, 3) strengthening of professional staff of authorities, 4) elimination of deficiency in industrial legislations regarding priority of nuclear legislation applying to industrial facilities that are part of nuclear facility, 5) providing of proper conditions for comprehensive independent expert review of safety of activity at NRIs by funds of the Federal Budget.

8. CONCLUSION

Practice of licensing of NRIs in Russian Federation indicate that there were no safety issues where the lack of scientific and technical data could cause a weakness in safety regulation and safe utilization of NRIs.

The strategy of further development of licensing shall be addressed to securing the global safety regime at NRIs including safety and security risk management.

As a scientific and technical support for decision-making in licensing process the following issues constitute priority in further investigation of NRIs safety:

- Clarification of different types of NRIs, including new projects of NRIs;
- Ageing management, clarification of ageing mechanism of SSC;
- Validation of numerical tools (codes) applied to assessment of potential severe accidents and their consequences and increasing codes accuracy.

The favorable conditions for partnership and exchange of experience including lessons learnt from licensing promote safety and security cultures.

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