Regulatory framework for the maintenance of the relevant knowledge in the atomic energy use sector

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**Abstract**

In accordance with the Atomic Act of the Russian Federation the employees and workers (personnel) of nuclear industry organisations, who occupy certain positions or perform specific activities in the field of atomic energy use can start to fulfil their duties only after getting a special permit issued by the state safety regulatory authority. Rostechnadzor issues permits for the specified kinds of activities to personal of nuclear facilities, organizations engaged in transportation of nuclear and radioactive materials, and enterprises performing physical protection and account of nuclear materials and radioactive substances. To enforce the provisions of the Atomic Act Rostechnadzor has developed a regulatory system (requirements, procedures and methodology) for continues supervision over the maintenance of the required level of knowledge and adequate understanding of the nuclear safety requirements by the nuclear personnel, depending on the nature of their job duties and work in sphere of nuclear energy use. The report presents a long-term experience of Rostechnadzor in implementing the effective regulatory system for maintenance of adequate level of knowledge and expertise of personnel of nuclear industry organisations and ensuring a competent workforce in the atomic energy use sector.

1. **Introduction**

The IAEA Safety Standards Series publication on the application of a management system for facilities and activities [1] indicates that an integrated management system (IMS) should be used to provide a comprehensive framework for the arrangements and processes necessary to address all the goals of nuclear industry organizations, including safety, health, environmental, security, quality and economic elements, and other considerations such as social responsibility. Knowledge management (KM)[[1]](#footnote-1) is an integral part of IMS to be functioning in nuclear industry organisations [2]. The regulatory activities should promote personnel competence (knowledge, skills and attitudes in a particular field) and adequate understanding of safety issues related to the personnel assigned jobs duties. Rostechnadzor[[2]](#footnote-2) has developed and implemented a regulatory system for granting permits to the nuclear industry organization’s employees and workers (nuclear personnel) for performing the work and duties in the field of atomic energy use. The system includes management procedures, methodology and scope of testing personnel knowledge and expertise in nuclear regulatory framework and relevant technology processes. The testing procedures depend on personnel position and his (her) specific activity, thus the graded approach is applied. The report presents a technical brief of experience and good practices in implementation of the above stated system and identified challenges in maintaining an appropriate level of knowledge of personnel of the licensed nuclear facilities and organizations rendering services to the operating organizations. It highlights the importance of people and safety culture for stimulation and nurture of explicit, implicit and tacit knowledge[[3]](#footnote-3) and use of safety regulation good practices.

1. **Purpose and Objectives of the KM in the Nuclear Energy Use Sector**

A purpose of the KM is to maintain adequate knowledge and expertise of personnel in the nuclear energy use sector. Main objective of the relevant regulatory activities is to contribute to maintaining a high level of competence of nuclear personnel through establishing an effective legislative and regulatory mechanism to control knowledge, skills and attitudes of all workers having a direct bearing on safety in the field of atomic energy use.

1. **Key Points of the KM**

***Legislative and Regulatory framework***

The Federal Law "Statute on the discipline of the employees of organizations operating extremely radiation- and nuclear-hazardous production units and facilities in the field of nuclear energy use" (№ 35-FZ from March 08, 2011) specifies that employees of operating organizations, who were not granted the permit for the right to conduct operations in the field of nuclear energy use, are not allowed to work in the field of nuclear energy use. Rostechnadzor is entitled to establish procedure for issuing the permits to employees in nuclear energy sector. The procedure has been set up by enforcing “Administrative Regulation for the State Service to be Provided by Rostechnadzor for Issuing Permits to Nuclear Facility Employees for Activities in the Field of Nuclear Energy Use” (Rostechnadzor’s Order № 721 from 21.12.2011), hereinafter – the Administrative Regulations, that was developed on the basis of following fundamentals:

* Federal Law “On the Use of Nuclear Energy”(№ 170-FZ from 21.11.1995), hereinafter – Atomic Act;
* Government decree of the Russian Federation "On endorsing the *list of nuclear facility employment positions, which require the permit* of Rostechnadzor for performing activities in the field of atomic energy use" (№ 240 from 03.03.1997);
* Unified skills guide for positions of managers, specialists and employees, section “Qualification Profiles for Positions of Nuclear Energy Organizations Staff” (the order of Ministry of Health of the Russian Federation № 977 from 10.12.2009).

All regulations related to issuing the permits for nuclear personnel are available at the Rostechnadzor’s Web-side portal [www.gosnadzor.ru](http://www.gosnadzor.ru) (state service). The list of job positions and activities in the field of nuclear energy use, which require a special permit of Rostechnadzor, covers managers and personnel having specified jobs duties and performing specified activities at nuclear facilities and organizations engaged in transportation of nuclear and radioactive materials, and enterprises performing account of nuclear materials and radioactive substances and their physical protection. Rostechnadzor has issued reference of legislative acts and regulations related to specific areas of nuclear energy use to inform executive bodies, organizations and public about the relevant regulatory framework. This reference is approved by Rostechnadzor order and has to be periodically revised.

In the Headquarters of Rostechnadzor there are three departments responsible for issuing permits to the personnel of facilities and organizations of nuclear energy use sector:

* Department for Safety Regulation of Nuclear Plants and Nuclear Research Facilities;
* Department for Safety Regulation of Nuclear Fuel Cycle Facilities, Nuclear Power Installations of Ships, and Radiation Hazardous Facilities;
* Department for Special Safety Issues (supervision of accounting and control of nuclear material and radioactive substances and their physical protection, emergency preparedness and response).

Besides, in the structure of Rostechnadzor there are six territorial Interregional Territorial Departments for Nuclear and Radiation Safety Supervision (hereinafter – Rostechnadzor ITDs), that are delegated to issue permits for performing jobs and activities to specified personnel of nuclear energy facilities and organizations within the territory of the Russian Federation. Delineation of responsibilities on issuing the permits between Rostechnadzor Headquarters and Rostechnadzor ITDs is defined in the Administrative Regulation.

***State Service for Issuing Permits***

To implement its job on issuing the above mentioned permits for nuclear personnel Rostechnadzor has developed procedures and tools for ongoing control and maintenance of relevant knowledge in the field of nuclear energy use. Thus, the Administrative Regulation specified:

* The full set and forms of the documents required to apply for getting Rostechnadzor permit depending on kind of nuclear facility and specific activity;
* The order, time schedule, and procedures for applying for and getting of the permit, its registration, renewal, continuation, and issuing a duplicate, including specifics of implementation of the administrative procedure in electronic form;
* The order and procedures for testing employees knowledge of the regulatory framework in the field of nuclear energy use;
* The form of the permit and attached validity conditions;
* Tracking and inspections of fulfillment of the permit validity conditions.

The above mentioned Governmental decree № 240 authorizes Rostechnadzor to issue the permits for senior managers, operating personnel, and personnel conducting in-service control of the following facilities and organizations:

* Nuclear power plant;
* Organizations operating industrial and prototype reactors;
* Nuclear research reactors, critical and subcritical stands;
* Nuclear power facility of ships (icebreaking fleet);
* Nuclear facility-ship of atomic-technological service (icebreaking fleet);
* Ship building industry involved in the construction and repair of nuclear power facility of ships of non-military nature (icebreaking fleet);
* Fuel cycle facility with nuclear and radiation hazardous sites;
* Radioactive waste storage facilities (specialized enterprises for radioactive waste management);
* Organizations (institutions, enterprises) operating radiation sources;
* Organizations (companies) involved in transportation of nuclear material, radioactive substances or their associated products;
* Organizations involved in the accounting and control of nuclear material and radioactive substances, and in their physical protection.

Evaluation of the applicant's theoretical knowledge is conducted by the examination commission appointed by the order of the Chairman of Rostechnadzor (or the Deputy). The members of the examination commission are Rostechnadzor staffs that are knowledgeable in applying safety requirements related to the duties and type of specific activity of the applicant in the field of nuclear energy use.

To be in compliance with requirements of the Administrative Regulation each department of the above mentioned Rostechnadzor Headquarters has developed a Questionnaire for testing theoretical knowledge (exams). These Questionnaires include questions pursuant to the regulatory framework in the field of nuclear energy use and specific safety aspects of the organizations or facilities. The Questionnaires are revised every five years and approved by the Head of the relevant Rostechnadzor Headquarters department. The operating organization shall use the Questionnaires to select those questions that are relevant to the job duties of a person to be examined. The list of selected questions for particular job position should be coordinated with Rostechnadzor ITD.

The knowledge assessment procedure (exam) consists of initial interviewing of applicant by the examination commission to clear up his (her) implicit and tacit knowledge on the job, and answering ten questions contained in an examination card to clear up an explicit knowledge on the job responsibility and accountability. The answer to each question can be assessed as "passed" or "failed". The result of knowledge assessment is considered positive if at least 80% of the questions have been passed and members of the examination commission have an affirmative opinion on applicant's attitude to safety culture.

The assessment of practical skill of the personnel operating technology processes is conducted by an examination commission of the operating organization. Rostechnadzor ITD coordinates attendance of its observer(s) in procedures of personnel testing.

State service for issuing the permits is provided free of charge. The personal permit indicates the following formal attributes: particular position, name of nuclear facility/organization, department, service, division, date of permit issue and expiry, permit reference number. The permit issued by Rostechnadzor Headquarters should be signed by the Deputy Chairman of Rostechnadzor, the permit issued by Rostechnadzor ITD should be signed by Head of Rostechnadzor ITD (its Deputy). The permit for activities in the field of nuclear energy use is valid for 5 years.

Questionnaires, results of exams and the issued permits are accumulated in the automated information system on nuclear and radiation safety of Rostechnadzor that is set to support supervision activity of Rostechnadzor Headquarters and Rostechnadzor ITD. Two technical support organizations of Rostechnadzor carry out activity on implementation and sustainable considerations of KM challenges within framework of Federal Target Programmes.

***Permit Conditions***

The integral part of the permit is the validity conditions, which are mandatory for personnel to perform a relevant type of activity. The validity conditions are stated based on the consideration of specific of primary and substituted job positions of the permit holder and specific features of a particular nuclear facility and/or organization. The conditions include the following mandatory requirements:

* A permit is valid only for the specified job position.
* A permit cannot be delegated or applied to any other person.
* A permit holder shall perform his (her) activity in compliance with the requirements of the relevant safety regulations in the field of nuclear energy use.
* A permit holder shall periodically be subjected to the medical and psychophysiological examinations.
* A permit holder cannot have a break for more than six (6) months in performing his (her) job duties.
* A permit holder shall continuously maintain and improve his (her) skill level.
* Depending on activities to be performed by a permit holder, the permit conditions may include special requirements related to safety in performing these activities.
* In case new regulations have been adopted, Rostechnadzor is entitled to amend the examination questions by new codes and regulations.

Violation of the permit conditions leads to application of sanctions including suspension or termination of the permit validity (deprivation of rights for performance of a relevant type of activity).

Rostechnadzor Headquarters and Rostechnadzor ITDs conduct on the permanent basis inspections to verify personnel training or re-training, procedures for admission of personnel to performing hazardous work, and fulfillment of person permit conditions. Resident inspectors of Rostechnadzor ITD are carrying out a permanent tracking of permits conditions in process of the planned safety monitoring. The inspection activity is based on provisions of Atomic Act and the following Governmental decrees:

* Provisions on the Federal State Supervision in the Field of Nuclear Energy Use (the RF Government Decree № 1044 from 15.10.2009);
* Provisions on the Regime of Permanent State Supervision at Nuclear Facilities (the RF Government Decree № 373 from 23.04.2012).

It is recognized that KM is an essential part of strategic planning, analysis and decision-making that should be considered at all stages of implementation of modern technology and new IMS procedures.

1. **Major Challenges in the KM in the Nuclear Energy Use Sector in the Russian Federation**

Major challenges are as following:

* Specialists coming to the nuclear energy industry have a high initial level of education in nuclear physics, thermo hydrodynamics, materials testing, chemical and technology processes, nuclear facility design, etc., but poor knowledge in safety requirements and nuclear legislation. The nuclear specialties and specializations of education and training programmes delivered by the Universities of the Russian Federation do not take into account the regulatory framework and the needs of Rostechnadzor activities.
* Recent licensing activities on decommissioning of nuclear facilities and environmental remediation reveal the need to amend the Administrative Regulation by specific knowledge management programme and a procedure for employees of organizations involved in decommissioning and environmental remediation activities.
* There is a need to expand the regulatory system for KM in order it will cover certification of workers performing building and service activities that may be critical for safety of nuclear facilities, for example, certification of welders and specialists in defectoscopy.

Furthermore, it was realized that computer based tools and computerized databases should be incorporated in human recourses related processes of the organizations much more widely and more effectively. For many nuclear facilities and activities the above mentioned tools are available through internal computerized information systems (such as an Intranet) [3].

1. **Conclusion**

The Russian Federation has established an effective regulatory system to maintain adequate knowledge and expertise of safety issues, and ensuring competent, properly authorised workforce in the nuclear energy use sector. The system includes considerations for bringing up safety culture and encourages nuclear staff to implement learning processes into their work practices, entity and habits.

Further efforts are to be made for developing and strengthening KM nuclear community, which unites all the spheres of the activity of nuclear industry organizations, scientific and technical support organizations, and regulatory body.

**References**

1. INTERNATIONAL ATOMIC ENERGY AGENCY, Application of the Management System for Facilities and Activities, IAEA Safety Standards Series No. GS-G-3.1, IAEA, Vienna (2006).
2. INTERNATIONAL ATOMIC ENERGY AGENCY, Knowledge Management for Nuclear Industry Operating Organizations, IAEA-TECDOC-1510, IAEA, Vienna (2006).
3. INTERNATIONAL ATOMIC ENERGY AGENCY, Risk Management of Knowledge Loss in Nuclear Industry Organizations, IAEA, Vienna (2006).

1. KN is defined as an integrated, systematic approach to identifying, acquiring, transforming, developing, disseminating, using, sharing, and preserving knowledge, relevant to achieving specified objectives. [↑](#footnote-ref-1)
2. The Federal Environmental, Industrial and Nuclear Supervision Service (Rostechnadzor) - the state regulatory authority in the field of the use of atomic energy, www.gosnadzor.ru [↑](#footnote-ref-2)
3. Implicit and tacit knowledge is knowledge that is held in a person’s mind and has typically not been captured or transferred in any form (if it were, it would then become explicit knowledge). It includes experience in specific areas, continuous improvement, learning, self-assessment, transfer of knowledge of nuclear programmes to a new generation of staff and other attributes for the safety culture. [↑](#footnote-ref-3)