

An enhancement of Regulatory Functions and Activities of PNRA by Implementing IAEA Safety Standards

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1. Introduction

The Pakistan Nuclear Regulatory Authority (PNRA) is an independent and competent regulatory body, empowered with the full scope of regulatory powers required by the IAEA standards. The Government provides the resources necessary to support PNRA's rapid expansion. The PNRA Ordinance No. III of 2001 and the associated regulations, which are mainly based on the IAEA safety standards, provide the binding legal framework for nuclear and radiation safety in Pakistan. The PNRA is responsible for controlling, regulating and supervising all matters related to nuclear safety and radiation protection measures in the Pakistan. To ensure the safe operation of the nuclear power plants in Pakistan, The PNRA is conducting effective regulatory activities for licensing, inspection, enforcement, lessons learned and emergency preparedness for nuclear power plants. The PNRA puts safety as its first priority, and has established its regulatory framework for nuclear and radiation safety. The PNRA fully complies with international requirements and specially IAEA requirements. This research highlights the PNRA regulatory practice and infrastructure for nuclear facilities and also discusses the areas needs to be improved in the light of IAEA Safety Requirements.

2. Methods and Results

This paper provides comparison of Pakistan's regulatory framework for nuclear safety against the IAEA Safety Standards (GSR Part 1). This section describes the PNRA regulatory functions and arrangements with the IAEA practices and examples, including authorization, development of regulatory guides, review and assessment, inspection and enforcement, and emergency preparedness. The areas needs to be improved in the light of the IAEA GSR Part [1] are also highlighted in this section.

2.1 Authorization of Nuclear Facilities

Pakistan has four operating power reactors, the Karachi Nuclear Power Plant (K-1) and the Chashma Nuclear Power Plants (C-1, C-2, C-3 and C-4). Pakistan also has three new units under construction, Chashma Units 4 and KANUPP Units 1 and 2. The PNRA also

licenses two research reactors, PARR-1 and PARR-2, both located at the PINSTECH national research institute. In addition to the licensing of the power reactors, the PNRA also licenses the operating personnel. The Regulation PAK/909 governs the licensing of all nuclear installations in Pakistan [4]. This includes the requirements for license application, and authorizations steps issued through the life of a facility. The PNRA has addressed aging management through a combination of processes. The PNRA only grants operating licences for a period of 10 years. At the conclusion of the 10-year period the licensee must submit a periodic safety review (PSR) for the PNRA review. In the case of operation beyond the design life, the licensee must submit a PSR along with an update to the documents submitted for the initial licence. The PNRA also has a process, criteria, and guidance for the application process for modifications to power reactors. Related to nuclear power plants, the PNRA also licenses manufacturers of Nuclear Safety Class equipment manufactured in Pakistan. The Regulation PAK/907 provides necessary submissions in support of an application. The Licensees for nuclear safety class equipment manufacturers are normally issued for a period of 5 years at the terms of which they are required to be revalidated.

Some important points noticed after comparison with the IAEA requirements for improvements of national requirements for authorization are as follows:

a) A formal documented process to allow appeals against its decisions regarding granting of an authorization to a facility, and activity and conditions attached with the authorization is not in place.

Basis 1: GSR Part 1 para. 4.32 states that "The regulatory body shall establish a process that allows the authorized party to appeal against a regulatory decision relating to an authorization for a facility or an activity or a condition attached to an authorization."

Basis 2: GSR Part 1 para. 2.5 (11) states that "The government shall promulgate laws and statutes to make provision for an effective governmental, legal and regulatory framework for safety. This framework for safety shall set out the following:

b) The PNRA has not developed guidance for licensing submissions defining format and content for nuclear facilities, which may result in applicants not fully

understanding the regulatory requirements and expectations.

Basis: GSR Part 1 para. 4.62 states that "The regulations and guides shall provide the framework for the regulatory requirements and conditions to be incorporated into individual authorizations or applications for authorization."

c) The PNRA lacks processes to involve the public in the authorization and licensing processes for NPPs.

Basis: SSG-12 para. 2.44 (d) states that "Comments from the public should be addressed at all steps of the licensing process."

2.2 Review and Assessment

The PNRA internal working procedure PNRA-WP-11005 provides guidance for the review and assessment process that is applicable to all review activities including both licensee submittals and internal documents. The procedure outlines the documents that are used by staff to form the basis of their conclusions. Where Pakistani regulations and requirements are not available, the process requires the staff to utilize USNRC documents, IAEA safety standards and Industry Codes and Standards. The PNRA review process includes utilization of Technical Support Organization (TSO) namely "Centre for Nuclear Safety (CNS)" to conduct reviews of submissions such as Site Evaluation Report (SER), Safety Analysis Reports, Periodic Safety Review Reports, Quality Assurance Programs, Radiation Protection Program, Pre-service inspection (PSI) and In-service Inspection (ISI) program and other safety related submissions as applicable. The review conclusions are prepared in the form of safety evaluation reports and comments which are then evaluated, approved and communicated by PNRA to the licensee. PNRA performs safety reviews and assessment for nuclear power plants during siting, design, construction, modification and operation of NPPs. The PNRA also performs reviews of PSR submittals required every ten years as part of the process for revalidation of the operating licence.

The PNRA has the necessary elements to ensure that reviews and assessment of activities it regulates are soundly based. Those reviews are carried out by qualified staff, and reviews are documented and retrievable. Areas of improvements include the definition of formal implementation plans after promulgation of new regulatory requirements, the development of enhanced guidance documents, and refined implementation of application the graded approach.

2.3 Inspection

The PNRA Ordinance 2001, Clause 29 provides the legal basis for carrying out regulatory inspections of nuclear facilities and activities [3]. The PNRA

Ordinance 2001, Clause 29 [3], and PAK/909, Section 11 provide the legal basis [4], so that the licensee has to provide regulatory inspectors with free and prompt access to any area of the facility, to all personnel of the facility and to all relevant documentation for the purposes of regulatory inspections. PNRA internal working procedure NSD-WP-001-R1 is the basis for the development of inspection programs for nuclear power plants. The PNRA develops a detailed inspection plan to inspect various activities during siting, manufacturing, construction, commissioning, operation and decommissioning of nuclear installations. The PNRA has a graded-approach for evaluating system performance including significance of issues. The PNRA internal working procedure NSD-WP-001-R1 provides the basis for the development of inspection program for nuclear power plants. For each planned inspection, a plan specific to that inspection is developed and provided to the licensee prior to the inspection. Thus the majority of the inspections are pre-planned and announced. Reactive inspections are conducted in response to unplanned, unexpected events. For each planned and reactive inspection, the team leader conducts an entrance meeting with the licensee to describe the purpose and objectives of the inspection. An outcome meeting is conducted at the end of the inspection to provide a summary of the potential findings, and to provide the licensee with the opportunity to discuss their program to address the weaknesses and discrepancies identified during the inspection. During the inspection, individual inspectors discuss their findings with the licensee counterparts.

The PNRA has operationally-focused inspectors which are extremely well trained in the simulator along with the licensed operators.

Basis: GSR Part 1, Requirement 11, para. 2.36 states that "The government:

a) Shall stipulate a necessary level of competence for persons with responsibilities in relation to the safety of facilities and activities;

b) Shall make provision for adequate arrangements for the regulatory body and its support organizations to build and maintain expertise in the disciplines necessary for discharge of the regulatory body's responsibilities in relation to safety."

The PNRA conducts extensive inspection activities, although aspects of the program lack a planned and systematic approach. The communications between PNRA inspectors and the licensees appeared is open and safety-focused. The PNRA inspection practice is generally in-line with the IAEA requirements; however there is need to optimize the existing inspection processes, including development and implementation of a planned and systematic inspection program and coordination of inspection activities across the regulatory organization.

2.4 Enforcement

The PNRA has issued regulation PAK/950 for enforcement within the legal framework for responding to non-compliances by parties specified in the authorization. The PAK/950 defines the administrative procedures and guidelines governing the use and implementation of the PNRA enforcement actions. Enforcement actions as prescribed in the Ordinance, the enforcement regulation combined with the PNRA internal guidance, are taken against non-compliances specified in the authorization and are dependent on the safety significance. The more severe enforcement actions may require referral to the Court of Law for penalties or potential imprisonment. The PNRA takes enforcement actions in the event of deviations from, or non-compliance with, the regulatory conditions and requirements. The PNRA enforcement actions taken against non-compliances with regulatory requirements or with any conditions specified in the authorization are dependent on the safety significance of the non-compliance, in accordance with a graded-approach. The PNRA enforcement actions may include written notification, imposition of additional regulatory requirements and conditions, written warnings, penalties (after prosecution by a court of law) and, ultimately revocation of the authorization. Regulatory enforcement may also entail prosecution, especially in cases where the authorized party does not cooperate satisfactorily in the remediation or resolution of the non-compliance. For all cases of NPP non-compliance, PNRA conducts discussions, regulatory meetings, and further assessment of the issue through follow-up inspections, etc. At each significant step in the enforcement process, the PNRA identifies and documents the nature of the non-compliance and the period of time allowed for corrective actions, and communicates this information in writing to the authorized parties.

A mechanism to allow the licensee a right of appeal does not exist. A regulation is being developed.

Basis: GSR Part 1 para. 2.5 (11) states that “the government shall promulgate laws and statutes to make provision for an effective governmental, legal and regulatory framework for safety”.

Basis: GSR Part 1 para. 4.32 states that “The regulatory body shall establish a process that allows the authorized party to appeal against a regulatory decision relating to an authorization for a facility or an activity or a condition attached to an authorization.”

The PNRA uses a graded-approach to enforcement, with clear delegation and assignment of responsibilities for the inspectors, and for the application of enforcement, administrative enforcement and penalties. The PNRA needs to improve the enforcement processes to ensure a consistent and timely application of enforcement for significant findings to ensure violations are addressed.

2.5 Regulations and Guides

The technical specified requirements regarding the safety of nuclear power plant are mostly provided by the PAK/910 for site evaluation, PAK/911 for design, PAK/913 for Operation, PAK/914 for emergency preparedness and response, PAK/915 for waste management, which has been built in fully reference of the IAEA Safety Standards of the time. The requirements in the PNRA regulations for the NPP generally reflect IAEA safety standards and are identical in most of the provisions.

The procedure for preparing PNRA regulations and guides covers the whole range of activities, under which the regulation and guides are developed. The PNRA does not involve interested parties in preparation and revision of regulatory guides.

a) A mechanism to consult with interested parties for preparing and revising guides is not in place.

Basis: GSR Part 1 para. 4.61 states that “... These processes shall involve consultation with interested parties in the development of the regulations and guides, with account taken of internationally agreed standards and the feedback of relevant experience.”

b) Implementation/transition plans for new requirements introduced in amended regulations are not present. The lack of such a process may contribute to differing opinions regarding interpretation of regulatory compliance.

Basis: GSR Part 1 para. 2.5 (9) states that “The government shall promulgate laws and statutes to make provision for an effective governmental, legal and regulatory framework for safety. This framework for safety shall set out the following: The authority and responsibility of the regulatory body for promulgating regulations and preparing guidance for their implementation;”

2.6 Emergency Preparedness and Response

The PNRA issued requirements on management of a nuclear or radiological emergency in PAK/914. This regulation is to be applied to all facilities and activities licensed by PNRA. The GS-R-2 served as a basis for preparing this regulation [2]. Starting from the practical goals of emergency response, through the definition of basic responsibilities and assessment of threats until all functional and infrastructural requirements, the PAK/914 follows the original version of GS-R-2. The arrangements for emergency planning zones are identical to such in GS-R-2 [2]. The practice is that the PNRA requires the licensee either to follow IAEA guidance (GS-G-2.1 Appendix II) or elaborate methodology on defining the size of the emergency zones. The licensee’s proposal on establishing the appropriate size of emergency zones has to be submitted to PNRA for approval. PNRA advises the government for public protection and other related issues in case of

an emergency. The PNRA also assists off-site response organizations and licensees in radiological assessment by deploying its radiation monitoring teams located at its regional offices and headquarters. The PNRA is the National Competent Authority for domestic and foreign emergencies and the National Warning Point, designated under the Early Notification and Assistance Conventions. The PNRA operates the National Radiation Emergency Coordination Centre within its premises. It has a sufficient amount of instruments for measurements, communication tools, mobile laboratories, etc. The following areas need improvement:

- a) Operational Interventional Levels (OILs) are in use in Pakistan, in compliance with the IAEA standards. However, the actual values of these OILs are based on an earlier IAEA document and are not consistent with the new concepts and frameworks published in GSG-2.

Basis: GS-R-2 para. 4.71 states that “For the precautionary action zone and the urgent protective action planning zone, arrangements shall be made for promptly assessing any radioactive contamination, releases of radioactive material and doses for the purpose of deciding on or adapting the urgent protective actions to be taken following a release of radioactive material. This capability shall ...”.

Basis: GSG-2 para. 5.13 states that “Appendix II provides selected examples of default OILs for deposition, levels of individual contamination, and contamination levels for food, milk and water, together with a plain language explanation of the OILs”.

- b) A quality assurance program is explicitly required by GS-R-2 for all hazard categories, but PAK/914 established the requirements only for categories I-III.

Basis: GS-R-2 para. 5.37 states that “The operator of a facility, practice or source in threat category I, II, III or IV and the off-site response organizations shall establish a quality assurance program, in accordance with international standards, ...”

The roles and responsibilities of on-site and off-site emergency response organizations are regularly exercised. Training courses, table top and field exercises have been performed to train the first responders like fire fighters, rescue, medical doctors, police, security agencies and border monitoring personnel. The preparation, conduct and evaluation of emergency exercises are consistent with the IAEA standards.

3. Conclusions

Since its creation in 2001, the PNRA has progressively established a regulatory framework covering activities licensed in Pakistan. This includes internal processes to review applications and submissions, and documentation of the basis for recommendation on licensing decision. Areas of improvements are suggested to ensure completeness and consistency of the existing regulatory framework, including in the regulations themselves and in the guidance provided to licensees. This paper, presents the comparison of the PNRA practice with international practice in the field of authorization, inspection, enforcement, regulations and guides, and emergency preparedness and response. After detailed study of national regulations and comparison with IAEA documents, some important points are suggested. These points need to consider by the regulatory body to enhance nuclear safety at the installation in Pakistan. This paper is helpful for the PNRA and others regulatory bodies to enhance regulatory requirements for nuclear safety in the light of IAEA requirements.

REFERENCES

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