REGULATORY APPROACH FOR DEVELOPMENT AND IMPLEMENTATION OF SAFETY-SECURITY INTERFACE

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Abstract

The overarching objective of nuclear safety and nuclear security is to protect the public, property, society and environment from harmful effects of ionizing radiation. The focus of nuclear safety is to prevent nuclear accidents arising from the unintentional and inadvertent acts. Whereas, nuclear security aims to prevent accidents and incidents arising from intentional and criminal acts. Therefore, both nuclear safety and nuclear security are equally significant for the sustainable use of nuclear energy.

Pakistan Nuclear Regulatory Authority (PNRA), the national nuclear regulator, has adopted systematic approach and methodology to deal with the interface of nuclear safety and nuclear security. The systematic approach consists of the arrangements and processes to deal with interface issues. These include mainly: regulatory framework for nuclear safety and security; process for developing safety and security requirements; unified licensing process; conduction of joint inspections; centralized emergency coordination; rotation policy for employees; transparency and confidentiality of information; modification management; human resource development; safety and security cultures assessment, etc.

Nonetheless, PNRA also recognizes that safety and security interface is easier said than to be done and there are many associated challenges at implementation level. These challenges include diversified knowledge and experience requirements for personnel dealing in these two disciplines; the overlapping issues of safety and security cultures; interface with cyber security;. Furthermore, at international level, few guidance documents are available to address safety and security interface.

This paper describes the PNRA's approach to deal with the interface of nuclear safety and nuclear security. It also addresses challenges in the implementation of nuclear safety and security interfaces.

1. INTRODUCTION

Sustainable use of nuclear energy requires both safe and secure operation of nuclear facilities. The potential risk associated with nuclear energy is the radiation hazard to public and environment arising from nuclear accident. Main focus of nuclear safety is on risks arising from unintended events initiated by human errors, natural occurrences, equipment failures or other internal events or interruptions (such as fire). Similarly, main focus of nuclear security is to provide protection against malicious acts (deliberate actions), including theft, sabotage and other criminal or unauthorized acts that may lead to radiation risk or other adverse situations. The acceptable risk to workers, the public and the environment cannot be different when the initiating event of a radiological release is due to human or equipment failures, internal or external events or an event of malicious origin. Prevention, control and mitigation of nuclear accidents are the major areas of convergence between safety and security and forms the basis for measures to be implemented for enhancing safety and security.

Nuclear safety and nuclear security have in common the aim of protecting human life, health and the environment from undue radiation hazards. Thus, implementation of effective nuclear safety measures and security measures ensure the protection against unacceptable risk of exposure to people and environment [1]. Both nuclear safety and nuclear security can be made effective through implementation of integrated regulatory oversight and properly managed safety-security interfaces. Regulatory authority is mainly responsible to develop requirements for safety-security interface and ensure the implementation by licensee through regulatory oversight.

With this backdrop, present study aims to explore approach adopted by Pakistan Nuclear Regulatory Authority (PNRA) for interface between safety and security while performing regulatory functions and activities. The paper provides an objective examination of the implementation of safety and security integration

as PNRA considers the interface of nuclear safety and nuclear security as an important regulatory approach. It also implements an integrated approach to identify and resolve interface issues. However, this amalgamation and integration is easier said than to be done and entails many associated challenges. The paper also examines those challenges associated with the interface in regulatory domain. This paper is limited to regulatory aspects of interface and does not address the operators' approach.

The paper is organized in three sections. Section one provides in-depth understanding of safety and security interface and its importance for sustainable use of nuclear energy. Section two explores PNRA's approach for safety and security interface in entire spectrum of nuclear regulatory activities. Section three analyses challenges while implementing integrated approach.

2. UNDERSTANDING INTERFACE

Nuclear safety and nuclear security evolved independently without exclusively interacting but influenced each other in many aspects. Both nuclear safety and nuclear security have some contrasting requirements but also share some common elements. They share common aim of protecting the public, property, society and environment from harmful effects of ionizing radiation—while also preserving their distinct principles. These conflicting and shared elements in the principles of safety and security formulate the basis for 'interface'.

Interface has a literary meaning that a point where two subjects meet and affect each other. There are areas of interaction in both nuclear safety and nuclear security which present opportunities that could be exploited for enhancement, or areas of conflict that could be mitigated. Safety-security interface can be achieved by identifying safety-security elements of both enhancement and conflicts. Conflicts cannot be avoided but can be managed.

Assuming an emergency evacuation scenario where safety group debates on opening all emergency access gates, whereas security group is arguing security checks on the emergency gates as well. This is how safety vs. security discussion actually happens. Debate intensifies with the element of culture into it. Like safety culture emphasis low obstacles and open communication for early evacuation, however, in contrast, security culture requires multiple barriers and confidentiality in the flow of information. This necessitates a regulatory approach for managing conflicts between the nuclear safety and security.

The International Atomic Energy Agency (IAEA) defines the safety–security interface as "Aspects of safety and security requirements and measures that could mutually complement or counteract one another" [2].

The following regulatory approach is suggested to manage the safety–security interface:

  i.   Identification of interface areas: The first step is to identify nuclear safety and nuclear security areas and other arrangements that must or could interact. This identification will enable to focus on regulatory requirements and related processes.
  ii.   Analysis of interactions: Once areas are identified, the next step is to analyse and assess the overlap. The analysis should focus to determine potential impacts on both safety and security whether the interaction is resulting in enhancements or contradictions.
  iii. Enhancement of commonalities: The areas of convergence which complement and enhance one another should be used for benefiting the regulatory processes and activities.
  iv.   Conflict resolution: Conflicts arising from interface between safety and security should appropriately be resolved. Activities and processes involving safety-security should be performed in coordinated manner to assess and resolve such conflicts [2].

3. PNRA APPROACH FOR INTERFACE

In Pakistan, peaceful applications of nuclear technology play an important role in the socio-economic development of the country. Pakistan has established an effective national legal and regulatory framework for the oversight of nuclear safety and nuclear security. Pakistan Nuclear Regulatory Authority (PNRA) was established in 2001 through the promulgation of PNRA Ordinance (Ordinance III of 2001), as the national nuclear regulatory authority. The Ordinance assigns PNRA with the responsibility of establishing and enforcing

implementation of regulatory framework to ensure the safe and secure applications of nuclear material, radioactive sources and radiation generators in the country [3].

To ensure a balanced approach for both safety and security, PNRA has adopted a systematic approach and methodology to deal with the interface of nuclear safety and nuclear security. The systematic approach includes arrangements to ensure that both nuclear safety and nuclear security are mutually supportive and complement each other in minimizing the radiological risks.

Followings are the salience of the regulatory approach adopted by PNRA:

3.1.   Regulatory Requirements for Interface

PNRA has set the following specific requirements for assessing and managing interface between safety and security in national nuclear security regulations. These requirements have to be implemented by the licensees:

- Clause 7(2) of PNRA Regulations on Security of Radioactive Sources — PAK/926 requires that "The licensee shall establish the safety and security interface to ensure that they do not adversely affect each other and that, to the degree possible, they are mutually supportive";

- Clause 10 of PNRA Regulations on Physical Protection of Nuclear Material and Nuclear Installations — PAK/925 requires that "(1) The licensee shall assess and manage the physical protection interface with safety in a manner to ensure that they do not adversely affect each other and that, to the degree possible, they are mutually supportive. (2) In case of a new facility, physical protection features shall be incorporated into the facility design in the initial design phase and also address interface issues with safety to avoid any conflicts and to be supportive of each other";

- Clause 9(2)(b) of PNRA Regulations on Management of a Nuclear or Radiological Emergency - (PAK/914) (Rev.0) requires that "The plans for response to a nuclear or radiological emergency shall be coordinated with any other plans such as plans for physical protection or firefighting, which may be implemented in an emergency in order to ensure that the simultaneous implementation of the plans would not seriously reduce their effectiveness or cause conflicts".

Other PNRA regulations which are under development/revision have also considered safety-security interface requirements.

3.2.   Process for Development of Regulations

PNRA has developed step-wise process for preparing, adopting, amending, revising and repealing PNRA Regulations. The process for formulating regulations considers involvement of safety and security experts and all stakeholders including the licensee, government and the general public. The process ensures that safety regulations are reviewed by security experts and security regulations are reviewed by safety specialists. It ensures that conflicting requirements are either avoided or enough clarity has been provided. The regulations set prime responsibility with the licensee for both safety and security. Any additional requirements are addressed in licence conditions.

The process helps to develop common understanding of requirements, ensure transparency and avoid ambiguity in the requirements.

3.3.   Unified Authorization Process

PNRA is entrusted with the responsibility of licensing and authorization of safe and secure management of nuclear and other radioactive materials and their associated facilities/activities in the country. PNRA issues licences and authorizations to nuclear installations for various stages during their lifetime; namely, site registration, construction, fuel load permit, operating licence, revalidation of operating licence, etc. PNRA also conducts licensing of operating personnel of nuclear power plants and research reactors to ensure that qualified and trained personnel having expertise in entire areas of nuclear operation including safety and security are available. All authorizations and licences are granted after satisfactory verification of applicable regulatory

requirements for both safety and security. Single License/Authorization is used for both safety and security. The process ensures that any conflicting requirement is properly addressed by the licensees.

3.4. Safety and Security Inspections Process

The process has been established for performing inspections to verify compliance of safety and security requirements and taking appropriate enforcement actions in case of non-compliance. The inspections are managed through Regional Nuclear Safety Directorates (RNSDs) and only qualified Inspectors perform regulatory inspections. There is an established criterion for designation of inspectors for both safety and security. Inspections are conducted by a team comprising of both safety and security inspectors from PNRA regional directorates. This helps in identifying and managing interface issues. The process includes issuance of directives to the licensees in the form of inspection reports in case of any deficiencies or non-compliances of requirements. PNRA ensures timely implementation of corrective actions through follow-up inspections.

3.5. Leadership and Management

Leadership for nuclear safety and nuclear security has a key role in addressing and resolving interface issues. PNRA has developed a management system which is consistent with IAEA GSR Part 2 - Leadership and Management for Safety. The management system defines roles and responsibilities for safety and security. In addition, PNRA is developing new Regulations on "Leadership and Management for Safety – (PAK/921)". The proposed regulations will also address requirements for safety and security interface.

3.6. Change/Modification Management

PNRA requires the licensee to get approval for any changes/modification to the facility related to safety or security. PNRA performs evaluations of all such changes/modifications to verify that they take account of the requirements of both safety and security and properly manage the interface between them.

3.7. Centralized Emergency Coordination Centre

PNRA has established a National Radiation Emergency Coordination Centre (NRECC) which acts as a centralized emergency coordination and event reporting centre for both nuclear safety and nuclear security events. NRECC acts as a point of contact/national warning point and remains available round-the-clock for receipt and dissemination of emergency notifications for preparedness and response to safety and security events.

NRECC is equipped with a network of six mobile radiological monitoring laboratories with field response teams, composed of trained individuals which provide response in case of both safety and security events. For its operational readiness, NRECC conducts different types of exercises related to both safety and security events. Under the Nuclear Emergency Management System (NEMS), NRECC also coordinates with other national organizations through Nuclear and Radiological Emergency Support Centre (NuRESC) and Pakistan Atomic Energy Commission's emergency centre.

3.8. Rotation Policy

In order to infuse safety, security and other regulatory expertise in its employees, PNRA has adopted a policy for rotation of its staff among different Directorates which necessitates workforce to develop a deep understanding of entire regulatory functions. Such rotation enables the workforce to learn about both safety and security of nuclear and radiation facilities by improving their skills and knowledge. Rotation policy also helps to avoid complacency.

3.9. Information Management

While regulating safety and security related activities, PNRA comes across with information which is sensitive in nature and requires protection against unauthorized disclosure and dissemination. Thus, PNRA has established a comprehensive process to deal with management of information while ensuring openness and transparency in safety related information and protection of sensitive information.

3.10. Human Resource Development

A sustainable human resource development provides foundation for nuclear safety and nuclear security. PNRA recognizes that both nuclear safety and nuclear security require their own expertise and methodology with understanding of each other's disciplines and requirements. For this PNRA has adopted two-pronged strategy:

i.   PNRA sponsors a fellowship program at the Pakistan Institute of Engineering and Applied Sciences (PIEAS) for MS in various nuclear disciplines. These fellows are offered courses and projects on Nuclear Security in addition to other courses mandatory for Nuclear Engineering. After completion of their MS degree, these fellows are absorbed in PNRA where they get on-the-job trainings.

ii. PNRA has established a National Institute of Safety and Security (NISAS) to impart trainings to newly recruited officers as well as arrange refresher courses for the existing staff in the field of Nuclear Safety and Nuclear Security. The mandatory professional courses for PNRA staff (Level-I and Level-II) also include nuclear safety and security.

3.11. Safety and Security Cultures

PNRA has conducted safety culture self-assessment at organizational level in collaboration with the IAEA. Based on self-assessment study, an action plan to improve safety culture is being implemented.

In addition, methodology for self-assessment of security culture within organization is in process. Once the security culture self-assessment is performed, the integration of the assessment of both cultures at organizational level will be worked out.

4. CHALLENGES

PNRA recognizes that safety and security interface is easier said than done and there are many associated challenges at implementation level. The challenges for the implementation of safety and security interface include:

- The development of common understanding of safety and security experts on interface issues
- The capacity building for addressing safety and security interface
- The enhancement of a comprehensive understanding of safety and security culture, harmonization of both cultures at organizational level and development of methodology for combined assessments
- Strengthening capabilities for cyber security in regulatory perspective keeping in consideration of nuclear safety and security interface

To cope with all these challenges, PNRA has identified the safety and security interface as an emerging field and planned competence development in this area in its Strategic Plan.

In addition, there are few of guidance documents available that address the safety and security interface for nuclear and other radioactive materials, associated facilities and activities. Also, there is a need for dedicated training course on the interface to develop capabilities of member states.

5. CONCLUSION

Nuclear safety and nuclear security are equally important for the protection of people and the environment from harmful effects of ionizing radiation.

Being the national nuclear regulator, PNRA has adopted systematic approach and methodology to deal with the interface of nuclear safety and nuclear security. The systemic approach consists of the arrangements to ensure that both nuclear safety and nuclear security are mutually supportive and complement one another in minimizing the radiological risks. Specific regulatory requirements for interface for licensees have issued. PNRA has developed unified process for issuance of regulations. Single authorization is issued for safety and security of facility. Joint inspections are carried out involving both safety and security experts. Besides focusing safety, the management system of PNRA defines roles and responsibilities related to nuclear security. No

change/modification related to safety and security can be done by the licensee without prior consent of PNRA. A dedicated centralized emergency coordination center has been established to handle both safety and security related emergencies. To inculcate both safety and security expertise in its workforce, PNRA has adopted rotation policy. Information related to safety and security is categorized and treated separately. Particular attention is being paid to develop human resource for both nuclear safety and security. After success story of safety culture self-assessment, work has been initiated for security culture self-assessment at organizational level.

Meanwhile, PNRA is also facing some challenges while implementing interface between safety and security. These challenges are related to development of common understanding of experts; human resource development; harmonization of safety and security cultures; and interface with cyber security. To cope with all these challenges, PNRA has identified the safety and security interface as an emerging field and planned competence development in longer run which will require support and cooperation of IAEA.

Furthermore, at international level, there are few guidance documents that address specifically the safety and security interface for nuclear and other radioactive materials, associated facilities and activities. Also, IAEA may develop capabilities of member states through arranging dedicated training course on the interface.

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