

# Developing the opportunities for building nuclear security

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**Abstract:** *The potential for criminal or intentional unauthorized acts involving or directed at nuclear or other radioactive material or their associated facilities and associated activities is an ongoing global concern. Because of their widespread use, nuclear and other radioactive materials are vulnerable to sabotage, or to being stolen, lost or acquired illegally by individuals or groups that may use them for malicious purposes. The objective of a nuclear security regime is to prevent, detect and respond to nuclear security events, and to protect persons, property, society and the environment from harmful consequences associated with nuclear and other radioactive materials.*

**KEYWORDS:** NUCLEAR AND RADIOACTIVE MATERIAL, NUCLEAR SECURITY REGIME, NUCLEAR SECURITY EVENTS, MALICIOUS PURPOSES, MALICIOUS ACTS.

## 1. Introduction

The fundamental goal of capacity building is to enhance the abilities of relevant stakeholders to assess, establish and implement elements of a nuclear security regime. The infrastructure needed for capacity building includes, among many other things, educational and training institutes with personnel competent in nuclear security, technical support centres, nuclear security laboratories and equipment, and the means to produce appropriate course materials.

In addressing how to build the capacity to establish, implement and sustain a nuclear security regime, it is necessary to look at the essential elements that should be in place and the underlying functions that make a security programme effective. The Nuclear Security Fundamentals [1] set out 12 essential elements of a nuclear security regime. Capacity building programmes need to be tailored to the national infrastructure and resources that are available, but also to address these 12 essential elements.

## 2. Objective and scope

The main objective - development of a national strategy for building the capacity of organizations and individuals to establish, implement and sustain an effective nuclear security regime [2]. The roles of governments, organizations and individuals in capacity building are defined and key elements of capacity building programmes are described. Methodologies are provided for using a systematic approach to develop capacity building programmes.

The term 'capacity' here refers to an organization or individual that has both the competence (knowledge, skills, and attitude) and capability (resources, authority, processes, equipment, means of deployment) needed to achieve their desired goal.

Capacity building for nuclear security refers to a systematic approach to the use of education, training, exercises, awareness raising, workforce management, knowledge management and knowledge networks to develop and continuously improve the governmental, organizational and individual competences and capabilities necessary for establishing, implementing and sustaining an effective nuclear security regime.

Human, technical and financial resources are necessary to ensure effective nuclear security. Infrastructure, equipment and other physical elements support a State's nuclear security regime.

## 3. Roles for capacity building

Capacity building programmes are typically developed with roles at the following three levels:

**Governmental:** Policy makers at the national level should enable capacity building by establishing the policies and frameworks within which organizations and individuals can operate effectively. Every country should clearly assign responsibilities and facilitate effective coordination mechanisms for national competent

authorities and other organizations that are responsible for implementing elements of the nuclear security regime, should also allocate sufficient resources for effective implementation of these elements.

**Organizational:** Competent authorities and organizations involved in nuclear security should develop nuclear security capacity building programmes for management, personnel and any other relevant stakeholders that address nuclear security systems and measures relevant to their respective responsibilities. This includes fostering coordination and cooperation between relevant organizations both within and outside of the nuclear security regime.

Organizations should communicate with the government about the resources and infrastructure that they need to develop the capacity to implement nuclear security measures while continuously fostering nuclear security culture.

**Individual:** Individuals with responsibilities for nuclear security should develop their knowledge, skills and capabilities for nuclear security through educational, training and awareness raising activities, and through exercises. Individuals may also benefit from participating in workforce management and knowledge management activities and from knowledge networks for nuclear security.

3.1 Roles of government [1]. The distribution of governmental responsibilities for capacity building will depend upon the existing legal, governmental and organizational arrangements. Every state may take into account international guidance and best practices in selecting the most effective distribution of responsibilities.

The government should ensure that sufficient human, financial and technical resources are available to the government and to organizations with nuclear security related responsibilities, and that an appropriate number of capable individuals within the country are available to successfully establish, implement and sustain a nuclear security regime.

In this context, the government should ensure the provision of resources for building and maintaining the competence of suitably qualified and experienced staff, and promote participation in national and international sharing of knowledge.

3.2 Roles of organizations. Organizations with nuclear security responsibilities include competent authorities and other organizations that deal directly with the security of nuclear and other radioactive materials, and organizations such as law enforcement or national security organizations with broader functions that include specific roles and functions related to nuclear security.

Specific nuclear security responsibilities need specialized knowledge, skills and experience that may necessitate (in addition to appropriate personnel selection procedures) education, training

and knowledge management to ensure that adequate capacities are developed within individual organizations or at the national level.

Organizations may develop their own nuclear security capacity building programmes and/or make use of capacity building programmes implemented at the national level.

3.3 Roles of individuals. Individuals with responsibilities for nuclear security are expected to cooperate in and contribute to building their own individual competences as well as the collective competences of their organizations.

Individuals need to understand the overall objective and strategy of nuclear security within their organizations and be able to communicate effectively and appropriately their observations and experiences to help identify and resolve issues and promote continuous improvement.

As well as developing their own knowledge, skills and experience, individuals involved in national nuclear security programmes should contribute to the development and continuous availability of the necessary collective knowledge to support the nuclear security regime in the country.

Such individuals may contribute to building their and others' competences by participating in programmes of continuing education and training, including planned and on-the-job training programmes. Individuals should also strive to contribute to the body of knowledge for nuclear security in their organization and pass on this knowledge through the mentoring and training of others.

#### 4. Capacity building elements

Capacity building includes several key elements, in particular education, training, exercises, awareness raising, workforce management, knowledge management and knowledge networks.

Education, training and exercise activities build capacity by facilitating the development of knowledge and skills, helping new and existing professionals to master the principles and technologies associated with nuclear security. In building capacity for nuclear security, awareness raising, targeting multiple audiences, can promote understanding of the importance of protecting nuclear and other radioactive materials.

4.1 Education. Nuclear security education includes individual courses and other formalized instructional activities conducted through educational institutions. Education programmes in nuclear security should aim to establish in-depth knowledge and thereby help foster a nuclear security culture [3] in a country or region. Ideally, persons interested in pursuing a career in nuclear security should be able to receive specialized education on nuclear security, as these educated individuals are expected in the future to design, implement and evaluate the State's nuclear security infrastructure.

A regional education programme could also be useful to establish a common understanding of nuclear security culture and enhance further collaboration on nuclear security with neighboring countries. Curricula for nuclear security education programmes should be developed through collaboration between the relevant stakeholders, which may include, for example, law enforcement and military academies and other designated nuclear security related organizations as well as universities and research institutions.

Education programmes may be tailored to suit the needs of the different organizations with responsibilities for nuclear security, including regulatory bodies and other competent authorities, law enforcement agencies and operators. The country may cooperate with other countries and international organizations to provide insights into the competences and resources necessary for implementing a national nuclear security education programme.

Prior to the development of curricula for such education, it may be useful to obtain experience of education in institutions in other States, either by sending students or by employing nuclear security

specialists from other States to provide academic and practical education.

4.2 Training and exercises. A well-trained workforce is needed for an organization to meet its nuclear security responsibilities and to contribute to an effective nuclear security regime. Selected members of this workforce may act as subject matter experts in developing more extensive training and educational materials and may serve as resources for building the national capacity for nuclear security.

Training, whether knowledge based or skill based, should be carefully designed to ensure its quality and effectiveness for the personnel being trained. Determining what is to be taught is critical to this process. This is accomplished through a systematic approach to training (SAT), which comprises five basic phases: analysis, design, development, implementation and evaluation. Evaluation occurs at each step of the process and also at the completion of the training cycle.

The evaluation results are then acted upon to ensure continuous improvement of the training activity and, where appropriate, as input to other performance improvements, if such results indicate organizational issues.

Training is generally focused on learning a new skill for a specific job or on improving performance. Fundamentally, an SAT should help to provide all of the training needed to address performance needs within the established competence framework. The first phase of the SAT is to determine the training needs of personnel at all levels and with all types of responsibility for nuclear security.

The use of exercises will enhance organizational readiness and help develop the processes and procedures to evaluate and monitor the effectiveness of detection and response systems. Nuclear security exercises provide a means to assess capacity building needs, build capacity and evaluate the effectiveness of capacity building efforts.

4.3 Awareness rising. Awareness rising differs from education or training in that its objective is limited to making the target audience aware of a particular condition, event or issue rather than providing broad knowledge or skills to accomplish a specific task.

Awareness is achieved when an individual, at whatever level (e.g. with national or organizational responsibilities, or a member of the public) internalizes information regarding nuclear security, threats, nuclear security systems and measures, and organizational roles and responsibilities relevant to his/her own responsibilities, and develops the desired behaviors and beliefs appropriate for his/her situation.

Awareness raising programmes are less formal than education or training in the method of development, delivery or measurement of effectiveness. Awareness programmes need to be implemented carefully in order to take into account the requirements for protection of sensitive information related to nuclear security and the 'need to know' rule, depending on the target audiences.

In order to establish a strategy for developing an awareness programme, goals should be established to focus awareness raising efforts, including the following:

Providing individuals with foundational knowledge and guidance relevant to their roles and responsibilities for nuclear security (e.g. information on nuclear security threats, detection options and operations) for building an effective nuclear security culture. This knowledge can provide a basis for advanced training and a broader understanding of one's responsibilities.

Fostering the development of political will of government entities and organizations to build and sustain nuclear security capabilities and programmes. It is believed that institutionalizing nuclear security within the responsible organization will enhance the effectiveness of national nuclear security capabilities. Promoting a common terminology and basis for raising awareness with the general public and non-governmental organizations.

4.4 Workforce management. The following elements should be incorporated into workforce management strategies: Workforce planning; Career management; Performance management [4].

#### 4.4.1 Workforce planning

Workforce planning involves addressing both short term and long term needs to continuously fulfil nuclear security responsibilities. It involves planning for the whole employment cycle, from recruitment to retirement, including short and long absences, special situations requiring extra resources and succession planning.

A recruiting strategy is needed to attract a high quality workforce to meet current and future staffing needs for nuclear programmes, including regulatory bodies and other competent authorities. Merit based promotion systems may help attract highly motivated candidates to the security field and encourage them to gain competences and achieve a higher performance level.

#### 4.4.2 Career management

Career management includes continuously motivating personnel with nuclear security responsibilities to continuously improve their performance. Providing appropriate remuneration commensurate with an employee's contribution is a good practice. Rewarding individual employees for outstanding performance may also serve to encourage the workforce in general to improve their performance and to contribute to achieving nuclear security objectives.

Another important consideration for career management is the planning of personal career paths. Providing a clear career path towards higher positions helps personnel set their own professional goals, thereby encouraging them to strive for promotion. This starts with assigning personnel to positions that fit their own competences and then allowing them to develop and continuously improve their overall nuclear security performance.

#### 4.4.3 Performance management

Performance management is a key part of workforce management, and includes periodic performance evaluation. In these periodic evaluations, particular emphasis should be placed on identifying possible gaps between expected and actual performance and the reasons for them.

Different skills are involved in fulfilling different nuclear security responsibilities. Some skills can be attained relatively quickly, but others take more time, and different individuals may also attain skills at different rates. Uneven development of individual skills needs to be evaluated from a long term perspective, and periodically reviewed to determine whether the situation is improving within expected timescales.

If weaknesses in performance are found to result from functional deficiencies in the workforce management programme (rather than weaknesses at the individual level), a thorough analysis should be carried out to identify the underlying causes of these deficiencies and correct them. These causes could include misinterpretation of needs, inadequate workforce planning, incomplete or ambiguous procedures, mismatches in personnel assignments, a lack of incentives to encourage better performance, or many others.

#### 4.5 Knowledge management

Nuclear security related knowledge needs to be appropriately managed in order for it to be used to effectively build capacity. The knowledge acquired in operating a nuclear security system should be shared among those with roles and responsibilities relating to the system, to achieve better performance. It should also be preserved in a manner allowing it to be efficiently transferred to individuals assigned such roles and responsibilities in the future. Therefore, knowledge management should be an integral part of capacity building programmes and needs to be aligned with workforce management strategies.

Knowledge management is an integrated, systematic approach to identifying, acquiring, transforming, developing, disseminating,

using and preserving knowledge, relevant to achieving specified objectives. States should aim at establishing a knowledge management system and coordinating related activities to build a structure in which to share and effectively transfer the necessary knowledge to support capacity building efforts.

Identifying the knowledge that needs to be managed for capacity building purposes should be the first step in a knowledge management process. The knowledge identified to meet these needs may be explicit, such as technical information on paper or in electronic form, or may be tacit, such as experience based insights and skills in the people implementing nuclear security measures. The identified knowledge, either explicit or tacit, needs to be recorded and stored in an organizational knowledge database.

#### 4.6 Knowledge networks

Knowledge management can be supported through the development and utilization of knowledge networks. Knowledge networks include people with nuclear security knowledge and serve as a platform to enable the analysis and sharing of such knowledge to supplement efforts to build national nuclear security capacity. Knowledge networks can be established at both the national and international levels.

Knowledge networks for nuclear security at the national level could serve as a pool of people considered as human resources to build national nuclear security capacity. For example, the graduates of Master of Science programmes in nuclear security might represent the list of people considered competent to serve as nuclear security officers in competent authorities and other nuclear related organizations. Establishing such a network helps to be equipped with competent human resources to continuously meet national nuclear security requirements. This network could include groups with different specializations, including, for example, analysis of national nuclear security policies, nuclear security risk assessment or design and evaluation of physical protection systems.

Knowledge networks for nuclear security at the national level could also support effective knowledge management. Knowledge networks based on specified types of responsibility in a national nuclear security regime are ideal units for effective knowledge sharing, among people with common roles, on good practices in those roles, thus encouraging continuous improvement of their performance.

### 5. *Interfaces with nuclear safety*

Nuclear security and safety have the common aim of protecting persons, property, society and the environment. Security and safety measures have to be designed and implemented in an integrated manner to develop synergy between these two areas and also in a way that security measures do not compromise safety and safety measures do not compromise security [1].

When building the capacity for nuclear security, there will be direct interfaces with nuclear safety. In addition, there may be interfaces with nuclear safeguards such as in nuclear material accounting and control. In practical terms, this means that there are likely to be many areas where building the capacity of regulators or operators can follow a common approach. In some cases, basic competences may be the same (e.g. using equipment for detection, and identification of radioactive material). In other cases, the individuals may be the same (e.g. inspectors having responsibilities in both safety and security).

Furthermore, a person with an education and experience in nuclear safety may work in nuclear security or safeguards for some portion of their career.

A major interface where capacity building may overlap is in emergency management. Safety and security will both be major considerations in addressing nuclear or radiological emergencies arising from nuclear security events. Although preparedness and response for a nuclear security event is different from that for a

nuclear or radiological emergency, the response arrangements need to have the capacity to work together seamlessly for the protection of the public and the environment [5].

The capacity to implement a nuclear security regime rests largely in countries laws and regulations, its organizations and the people in those organizations. Consequently, these also affect, either directly or indirectly, the implementation of safety and material accounting and control, especially at nuclear facilities.

Therefore, the capacity that is developed at the regulatory and facility level should take into consideration how security will be applied and how this interfaces with other programmes such as safety. For example, if there is a single regulatory body for safety and security, then that regulator might share resources for its rulemaking, inspection and enforcement. These resources represent the capacity of the regulator to perform its duties.

As another example [6], a nuclear facility operator needs to implement all requirements for safety, security and nuclear material accounting. Therefore, it is most effective and efficient if the management systems, procedures and personnel at the facility are designed to take maximum advantage of shared facilities, equipment and resources and to work together to achieve their respective goals (to the extent possible, taking into consideration the differences between these areas).

## 5. Conclusion

Building capacity for nuclear security should be undertaken via a systematic approach that includes provisions for assessment, planning, implementation, documentation, evaluation and feedback.

This approach should be developed as part of a national security policy and implementation strategy. Before initiating the approach, the government should decide which organizations should coordinate the approach at the national level. Furthermore, each organization with responsibilities should assign a unit to perform the necessary work.

Building the capacity of organizations and people to establish, implement and sustain a nuclear security regime is an essential responsibility of an each country.

Analysis of national nuclear security needs and existing infrastructure should drive the development of capacity building programmes to combat the threat of sabotage or the use of nuclear or other radioactive material for malicious acts, and to prepare effective response measures to nuclear security events.

## 6. Acknowledgement

The issues discussed in this report are aimed at the implementation of Work Package 2 "Intelligent Security Systems" of the project BG05M2OP001-1.002-0006 "Construction and development of a Center of Competence" Quantum communication, intelligent security systems and risk management (Quasar) ", which has received funding from the European Regional Development Fund through the Operational Program "Science and Education for Smart Growth" 2014-2020.

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