Lecture 1. INTRODUCTION TO NUCLEAR SAFETY AND SECURITY

Course “New Challenges to the Nonproliferation Regime”

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o Basic definitions of nuclear safety and nuclear security, differences and interface

o IAEA Nuclear Safety Standards and IAEA Nuclear Security Series publications and its status

o State’s responsibility for nuclear security regime, competent national authorities

o Key elements of national nuclear security regulatory framework
DEFINITIONS

**Nuclear Safety:** “The achievement of proper operating conditions, prevention of accidents or mitigation of accident consequences, resulting in protection of workers, the public and the environment from undue radiation hazards” (IAEA Safety Glossary)

**Nuclear Security:** “The prevention and detection of, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear materials, other radioactive substances, or their associated facilities” (IAEA AdSec Group, under discussion)
Nuclear Safety: Main concerns are radiological risk to human and environment, whatever the cause. For nuclear power plants causes could be human errors, equipment failure, internal events (fire, pipe break, etc.) and external events (earthquakes, flooding, etc.).

Nuclear Security: Main concerns are theft of nuclear and other radioactive material and radiological sabotage of a nuclear facility or nuclear and radioactive material in storage or in transportation. Any malicious act.
While nuclear safety and security share a common objective, there are points of potential conflict between the measures taken in each area to accomplish that objective:

- Safety requirements for emergency egress versus security requirements to minimize access points
- Safety requirements for transparency versus security requirements to maintain confidentiality of security information

Designers and operators must take care to ensure that security measures do not compromise safety and that safety measures do not compromise security.
Why interfacing?

- Nuclear safety and nuclear security share the same overall objective: To protect people, property and environment from radiological hazards.
- The acceptable risk should be the same whether the initiating event of a radiological release is due to human and equipment failures, internal and external events or an event of malicious origin.

The workers, public, and environment are subjected to threats arising from both safety and security related hazards.

A more effective protection of people and the environment can be achieved through a proper interface of both nuclear safety and nuclear security.
Nuclear safety is necessary, but cannot protect on its own, nuclear or other radioactive material from un-authorised access, theft, diversion, sabotage, or other malicious acts.

Similarly, nuclear security is necessary, but not sufficient on its own to protect people or environment from a nuclear accident.
A single and coherent system in which all the parts of an organization are integrated to enable achieving its objectives.

Safety and Security Synergy: Reinforcement of one another:
In most situations → elements or actions in one area also enhances the other area, confinement building serves to prevent a significant release of radioactive material to the environment in accident conditions (safety), it also provides a robust structure that protects the reactor from a terrorist attack (security).
IAEA Safety Functions
(Article III.A.6 of Statute)

Facilitate and service international conventions and other undertakings

“To establish or adopt… [in consultation …] standards of safety for protection of health & minimization of danger to life and property”

“…and to provide for the application of these standards…”
STATUS

Safety Standards are:

- Non binding on Member States but may be adopted by them
- Binding for IAEA’s own activities
- Binding on States in relation to operations assisted by the IAEA or States wishing to enter into project agreements with IAEA
Fundamental safety objective and principles for protecting people and environment

Requirements that must be met to ensure protection of people and environment – 'shall'

Recommended ways of meeting the requirements
Global Nuclear Safety Regime

Intergovernmental agreements (Conventions on Nuclear safety; on Early notification; on Assistance in case of nuclear accident and on Safety of spent fuel and radioactive waste management) and Codes of Conducts (RR, radioactive sources)

Establishment and global acceptance of IAEA safety standards

IAEA Safety Review services
Integrated Safety approach

Global and regional network of knowledge and experience

Continuous improvement of national safety infrastructures

National Regulatory Systems

Operators & Users of Facilities / Activities

Research Institutes and Universities
The Nuclear Security Series (NSS), developed in close consultation with Member States’ experts, bring together best practices acceptable to the international community for broad implementation.

The Nuclear Security Guidance Committee (NSGC), open to all Member States, makes recommendations on the development and review of the Nuclear Security Series.

26 NSS Publications include:
1 Fundamentals
3 Recommendations
22 Implementing and Technical Guides
Regulatory Framework in the Hierarchie of the Legislative and Regulatory Infrastructure for Nuclear Security

International Commitments

Binding international Treaties, UNSC Resolutions, Conventions
Non-Binding international Codes and Documents

National Legislation

Laws

Regulations

Guidance Documents

Facility/User Licenses and Plans

Nuclear Security Regulation Framework
Nuclear Security Regime

The responsibility for nuclear security rests entirely with individual States.

A State’s national competent authorities are responsible for establishing an appropriate nuclear security regime which is based on international legal instruments for nuclear security (Fundamentals).

- Establishment of a Legal and Regulatory Framework
- Implementation of Preventive Measures
- Establishment of effective border monitoring and/or detection systems
- Implementation of Response Measures
- Human Resource Development
- Nuclear Security Culture
TWELVE ESSENTIAL ELEMENTS OF A STATE’S NUCLEAR SECURITY REGIME (NSS № 20)

1. State responsibility
2. Identification and definition of NS responsibilities
3. Legislative and regulatory framework
4. International transport of NM and other radioactive material
5. Offences and penalties including criminalization
6. International cooperation and assistance
7. Identification and assessment of NS threats
8. Identification and assessments of targets and potential consequences
9. Use of risk informed approaches
10. Detection of nuclear security events
11. Planning for, preparedness for, and response to a nuclear security event
12. Sustaining a nuclear security regime
Nuclear Security Responsibilities

State
- Establishes, maintains, and implements a Nuclear Security Regime
- Establishes and maintains a legislative and regulatory framework

Competent Authorities
- Implement a legislative and regulatory framework

License Holder
- Implementing physical protection measures and systems
- NMAC measures and systems
- Preventive and protective measures and systems
Nuclear Security Coordination within a State

- Coordinating Body or Mechanism
- Governmental Policy Authorities
- Military Forces
- Customs
- Intelligence Services
- Legislative Authorities
- Police
- Border Protection
- Regulatory Bodies
- Civil Defence
- Medical and Emergency Services
- Judiciary
Key elements of a Regulatory Framework

- General requirements may be codified in legislation, detailed requirements are typically promulgated by the regulatory body in regulations or rules.

- Legislation should make it clear that the authorized person in the possession or control of nuclear material bears the primary responsibility for its physical protection,
  - including limiting access to the materials or the facility to a minimum number of persons and establishing and maintaining clearly defined protection areas.

- Other responsibilities of authorized persons are typically set forth in regulations promulgated by the regulatory body, rather than in legislation.
Key elements of a Regulatory Framework, cont’d

The State should establish or designate a competent authority(es) under State legislation:

- responsible for implementation of regulatory framework
- should be provided with adequate authority, competence and financial and human resources to be able to fulfil its assigned responsibilities
- effective independence between the functions of competent authority and those of any other body in charge of promotion or utilization of nuclear energy
Key elements of a Regulatory Framework, cont’d

State’s competent authority should have access to information from the State’s system of accounting for and control of nuclear material (SSAC)

Enforcement of nuclear security regulations is a necessary part of State’s nuclear security regime.

Sanctions and penalties against the unauthorized removal of nuclear material and against sabotage are important to an effective State’s nuclear security regime.
Key elements of a Regulatory Framework, cont’d

Law enforcement:

competent authority should be provided adequate authority to enforce nuclear security requirements based on:

- administrative sanctions for the unauthorized removal or use of NM and for non-compliance with PP requirements
- a range of criminal sanctions for more serious violations (such as sabotage)

If elements of State system of nuclear security are divided between two or more authorities:

Arrangements for overall coordination necessary

Clear lines of responsibility should be established and recorded between relevant entities

State’s competent authority should have access to information from other State authorities on present and foreseeable threats to nuclear activities
Key elements of a Regulatory Framework, cont’d

State regulates the **categorization of nuclear material:**

For protection against *unauthorized removal* of nuclear material,

In order to ensure appropriate relationship between nuclear material of concern and protection measures

States establish **design objectives:**

To protect against *sabotage*, pertaining to off-site radiological consequences,

In order to determine appropriate level of physical protection measures

States should apply more stringent nuclear security requirements, either against *unauthorized removal* of nuclear material or against *sabotage*
Inspection and quality assurance:

- The State (through the competent authority) should verify continued compliance with PP requirements through periodic inspections and other monitoring procedures.
  - Important: State needs to be able to conduct inspections of nuclear facilities/vehicles used for the transport of NM
  - Quality assurance policy and programmes to provide confidence that specified PP requirements are satisfied

- States should be ensuring that corrective actions are taken, when needed

State regulations also address:

- The implementation of rapid and comprehensive measures to locate and recover missing or stolen Nuclear Material

  Mitigation and/or Minimization of the radiological consequences of a radiological release caused by an act of sabotage.
Nuclear Safety and Nuclear Security share the same objective: to protect people, property and environment from radiological hazards;
A more effective protection can be achieved through a proper interface of both nuclear safety and nuclear security. Integration of safety and security should be considered in all stages of the nuclear fuel cycle;
IAEA Safety Standards and Nuclear Security Series publications implementation is the essential tool at international and national levels;
State’s nuclear security regime should be based on 12 essential elements and demands a proper coordination among the competent bodies
Thank you for your attention!

Questions?