

Nuclear Safety and Security Interface

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Concept

- A Dutch cryptographer Kerchoffs Oxiom in 1883 provided a concept which stated that systems should be designed to be secure even if all its details are known as :
“Threats Keep Evolving”

Later a US Mathematician Claude Shannon in 1948 elaborated that protection of information during communication is a key factor in security.

It was then thought that if a facility is not secure-- IS IT SAVE ??

This is how security gained importance for facilities having higher potential of risk.

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Nuclear Safety

- Definition: 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.
- Main focus of safety is on risks arising from **unintended events** initiated by **natural occurrences** (such as earthquakes), **hardware failures**, other **internal events** or interruptions (such as fire, pipe breakage), or **human mistakes** (such as the incorrect application of procedures).

Nuclear Security

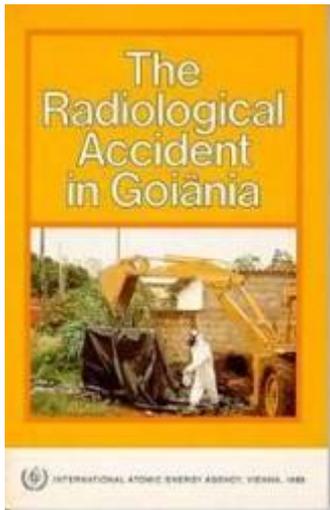
- Definition: The prevention and detection of, and response to, theft, sabotage, unauthorized access, illegal transfer or other malicious acts involving nuclear material, other radioactive substances or their associated facilities.
- Main focus is to provide protection against malicious acts (deliberate actions), including theft, sabotage and other criminal or intentional unauthorized acts that may lead to unacceptable radiological consequences or other adverse situations.

Nuclear Safety and Security

SAFETY

Inadvertent loss
or damage

- Misplaced
- Forgotten
- Accidents



SECURITY

Intentional

Damage

- Sabotage

Acquisition

- Theft
- Illegal purchase

Malicious

- Cause Terror
- Intent to harm other(s)

Financial

- Illegal sale for profit
- Avoidance of costs of ownership
- Extortion

What is the Common Goal of Safety and Security

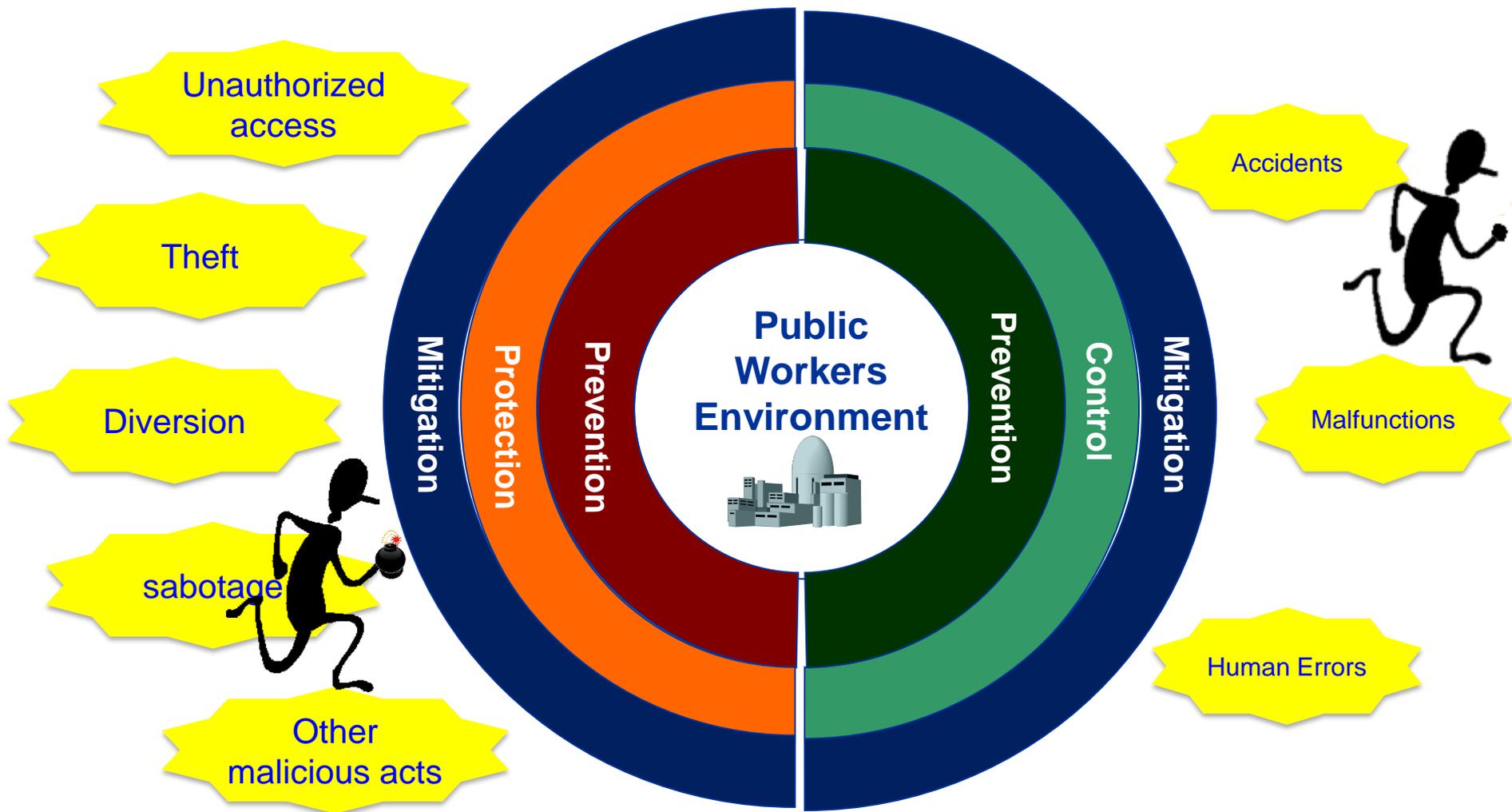
- **Safety** measures and **security** measures have in common the **aim of protecting human life and health and the environment.**
- The **acceptable risk** is reasonably the same whether the initiating cause is a safety or a security event.

SECURITY



SAFETY

Role of Safety and Security in Protection against Undesirable Radiological Consequences



Who is Responsible

- **State**

- Policy making

- International commitment

- Legislative and Regulatory framework

- Designate Regulatory Bodies

- **Regulatory Authority**

- Prepare regulatory requirements for Safety and Security

- Inspection and enforcement

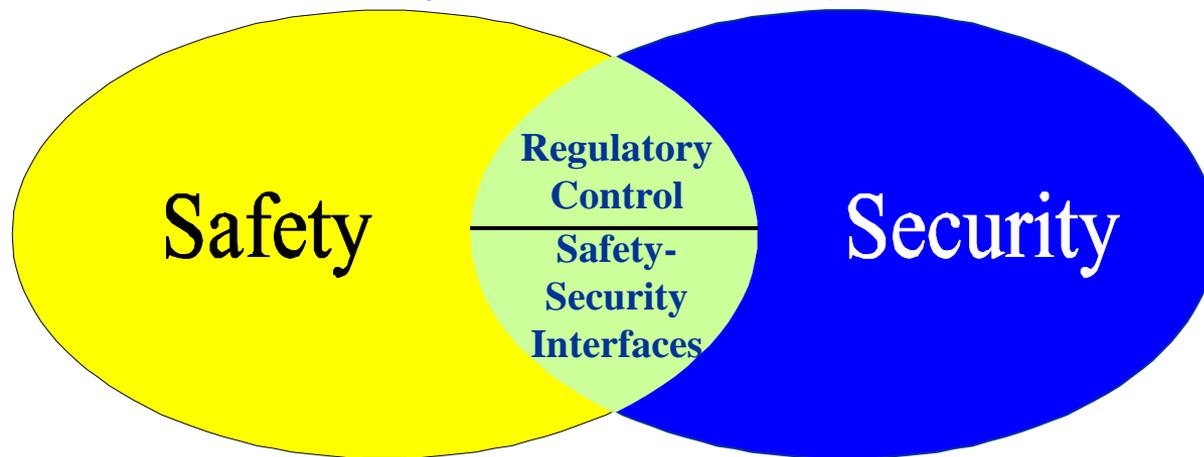
- Emergency Response

- **Operator**

- Safe and Secure operation considering regulatory requirements and DBAs and DBTs

What is Safety-Security Interface

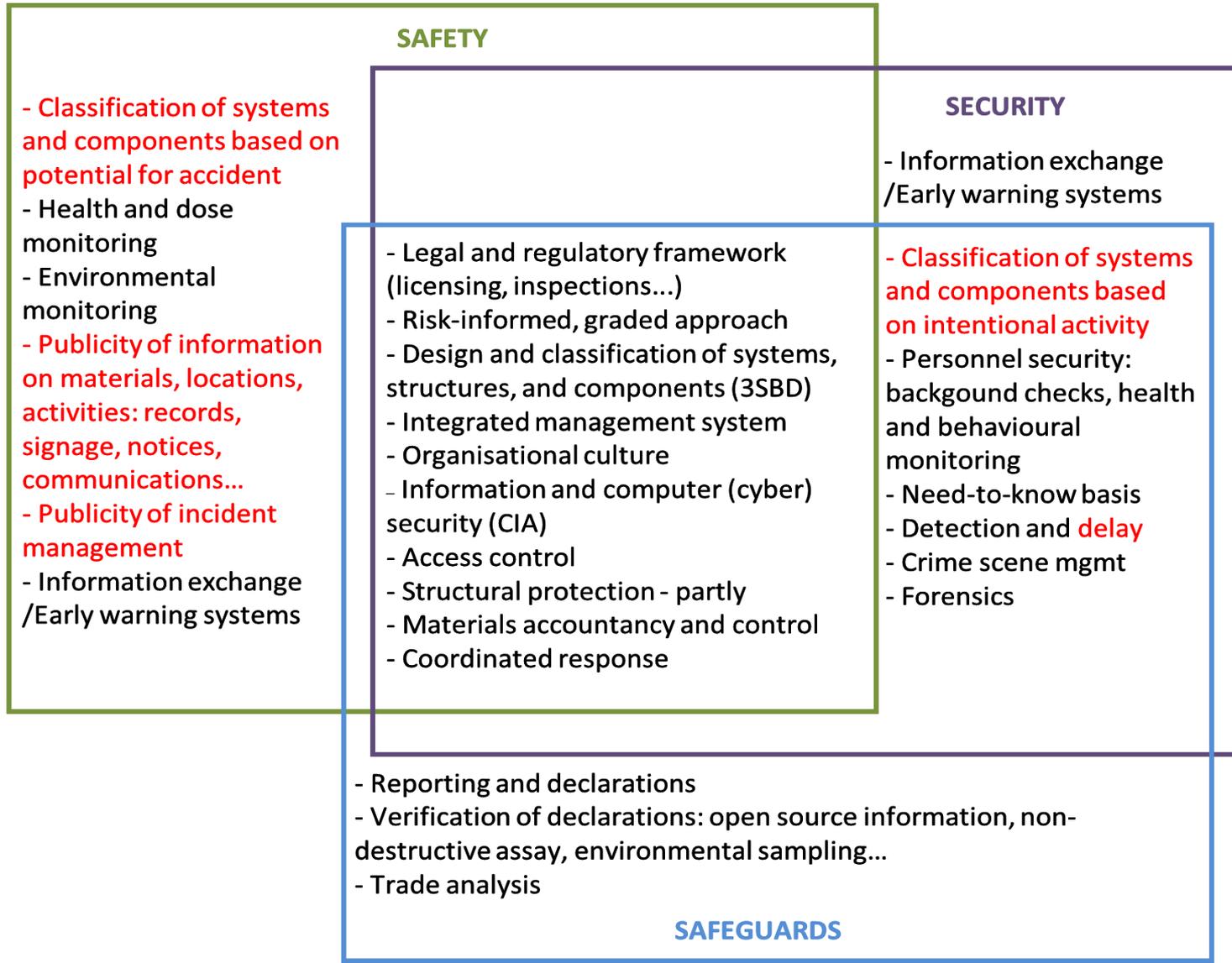
- In safety and security programmes, there are or could be **overlap** also known as interfaces. These areas of overlap present opportunities that could be exploited for **synergy**, or areas of **conflict** that could be resolved.
- Understand and identify these overlaps.



Nuclear Safety
Programme

Nuclear Security
Programme

3S Synergies



International level efforts

INSAG-AdSec Meetings

- For the **Safety-Security interface** efforts were initiated by AdSec in 2016 and a **first coordination meeting between AdSec and INSAG** was held in **May 2017**. INSAG-24 document prepared ten years earlier was considered as a reference document for further work on interface.
- **Follow-up coordination meeting** was held in **October 2018**. During this meeting **Gaps, Challenges and good practices** were identified in **implementing measures** and **HR harmonised programs and exercises** were also considered important.
- **In a sideline meeting of INSAG during GC-63 in September 2019**, the related progress was discussed. **Experts from AdSec also participated in the meeting**. DDG NSNI emphasised for a coordinated approach for the safety-security interface. It was agreed that:
 1. **Awareness about Safety-security interface** should be promoted in the Member States.
 2. **HR development programs** to include such interface should be prepared (combined staff training and exercises)

Areas that Require Strong Consideration for Interface

- Risk assessment
- Resilience of design
- Defense in Depth
- Integrated Management
- Safety-Security Culture
- Graded Approach
- Common Trainings and Exercises
- Emergency Preparedness

What is Defense-in-depth

Safety and security both consider defense-in-depth for providing **successive layers of protection**; however, they differ in their strategy and implementation.

Nuclear Safety

- Preventing deviations from normal operation;
- Controlling deviations from operational states;
- Controlling accidents within the design basis;
- Mitigating accidents and ensuring confinement of radioactive materials;
- Emergency Preparedness for Mitigating the consequences of radioactive releases.

Nuclear Security

- Deterrence
- Detecting the adversary;
- Delaying the adversary;
- Responding to and neutralizing the adversary.

Integrated Management System

- Management system should **integrate** all **quality, health, economic and environmental aspects as well as safety and security into a single coherent framework** for management to adequately direct the interactions and interfaces between diverse activities and disciplines.
- The integrated management system needs to **clearly identify not only safety and security as distinct processes** to be managed, **but also the interface between them.**

Safety Culture

- The assembly of **characteristics and attitudes in organizations** and **individuals** which establishes that, as an **overriding priority**, protection and safety **issues receive the attention warranted by their significance.**

Security Culture

- The assembly of characteristics, attitudes and behaviour of individuals, organizations and institutions which **serves as a means to support and enhance nuclear security.**

Security – Safety Culture (1/2)

- Safety culture and security culture are based on similar principles.
- The safety and security interfaces should be strengthened by building safety culture and nuclear security culture into the management system.
- Management should seek the promotion of both safety and security culture.

Security – Safety Culture

Some Differences (2/2)

Security Culture	Safety Culture
Confidentiality (information is need to know)	Transparency, openness and sharing information
Nuclear security information could reveal a vulnerability which an adversary could exploit	Share feedback on experience, thereby preventing occurrences of incidents or accidents
Nature and details of threats and countermeasures are not made public	External hazards to which the facility has to be designed are in public domain: earthquakes, flooding, wind loading, extreme temperatures, etc
Human factor- deliberate acts	Human factor- Errors.

What is Graded Approach

- Use of a **graded approach** means that the **safety requirements and security** recommendations have to be applied in a way that is **commensurate with the potential hazards of the facility**.
- **Higher levels of protection** is required against **events that could result in higher consequences**.

Preparedness and Response

- Information and intelligence
- The **emergency and contingency plans** need to be **developed in an integrated and coherent manner**;
- While they mostly remain separate plans, **their interface, need to be clearly understood** by all involved persons and organizations.

Interface at Design Stage (1/3)

Safety Design	Security Advantage
Use of passive systems to avoid human errors	Makes it more difficult for potential adversaries to tamper with safety systems
Introduction of robustness against human errors	May serve to increase protection against an insider threat
Doors or barriers for radiation protection purposes	Serves a security function by delaying or preventing unauthorized access
Safety specialists have knowledge of potential consequences of the failures of equipment important to safety and control	Useful in helping security specialists to identify sensitive targets

Interface at Design Stage (2/3)

Security Design	Safety Advantage
Personnel screening	Increases the reliability of personnel employed
Access Control	Prevents unauthorized persons from accidentally affecting safety equipment availability or reliability
Robust security doors	Provide radiological barrier
Security guards	Provide identification of abnormal events during off-hours Aid in evacuation and control post accident access to the facility
Security Barriers	Provide control of areas for industrial safety purposes

5Cs - Key to Success

1. Cooperation
2. Coordination
3. Communication
4. Continuation
5. Commitment

Regulatory Approach for Safety/Security Interface in Pakistan (1/2)

- **PNRA being a sole Regulator for nuclear safety and security**, has adopted systematic approach and methodology to deal with the interface of nuclear safety and nuclear security to achieve same objective to protect life, health and property from radiological consequences.
- **Principles of Leadership**, Management and Safety & Security Cultures have been addressed in regulatory framework to achieve the common goal of safety and security.
- **Recognition that safety and security** require their own expertise and methodology with understanding of each other's disciplines and requirements.
- **Rotation policy for experts** to avoid complacency.

Regulatory Approach for Safety/Security Interface in Pakistan (2/2)

- **Regulations address interface issues** and the requirements are based on the concepts of defence in depth and **graded approach**.
- **Common license** for both safety and security.
- **Common inspection programme** for safety and security and conduct of joint exercises.
- **Centralized emergency coordination** and event reporting mechanism for both nuclear safety and nuclear security events.
- Mechanism to resolve the interface issues with the licensee.
- **Training infrastructure** to develop capacity building in nuclear safety and security.
- Interface issues are addressed and incorporated in the **initial design** phase of nuclear installations and carried out **through out the life** .

Summary

- Nuclear Safety and security have the same general aim in protecting the public and the environment from harmful effects of radiation.
- In Pakistan Nuclear Safety and security share a common regulatory approach.
- Since Safety measures and security measures can have impact on each other, these are reviewed by the regulator at the design stage and implemented in an coordinated manner by the vendors/ operators under the regulatory oversight of a Nuclear installation so these are not compromised at any stage of project and during operations.

Thanks