3S Integration: Role of Radiation Measurements in 3S

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Role of Nuclear Safety, Security, and Safeguards at Nuclear Power Plants (NPP)

- Operation of Nuclear Power Plant (NPP) results in generation of tremendous amount of radiation and radioactive material. These have to be contained
  - Protection of workers, public, and environment is a major part of the NPP operation and management (Nuclear Safety and Security)
- Material and experience can be abused, hence
  - Material safeguards is of critical importance (Nuclear Security and Safeguards)
- Development of human resources and expertise in Safety, Security, and Safeguards is crucial
What elements or factors affect or influence decisions related to the RNEP?

All of these elements are related, is there a clear method for understanding these complex, adaptive relationships?

Our Answer (Hypothesis) is: Systems Framework
Our Systems Framework – Model

SYSTEM: Responsible Nuclear Energy Program

① Minimize risks to:

Workers  Public  Environment  Infrastructure

② Through a:

 Responsible Nuclear Energy Program

Under any condition/event (Real or hypothetical)

③ That balances:

System Attributes

System Objective:
Utilize Nuclear Energy to improve standard of living

Our Systems Framework – Model

What is the 3S Role?

Connection of 3S to RNEP

- Per our RNEP Model, technical solutions and human (social) behaviors combine to operate the RNEP, which should:
  - Pose minimum additional risk to the safety of the workers, public, or environment
  - Reduce additional risk to the security of the public or infrastructure
  - Meet its safeguards obligations under its international agreements

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What is the 3S Role?

Connection of to the RNEP Attributes

- What role do safety, security, and safeguards (3S) play in a responsible nuclear energy program (RNEP):
  - Minimize the risk to the workers, public, environment and infrastructure? **Yes**.
  - In isolation from other components of RNEP? **NO**.
  - As an integrated framework? **Yes**.

- The RNEP can best meet its goal of minimizing risk to the workers, public, environment and infrastructure through a balanced integrated nuclear safety, security, and safeguards (3S) framework.

Current (Traditional) 3S Framework

- Stove-piped areas of expertise
  - Separated S’s
    - Separate Cultures
    - Separate Operations

- Prescriptive
  - Based on individually established policies

- Descriptive
  - Focuses on interface between existing cultures and tools

- Reactionary

Do you see a similar framework in your organizations?
Challenge with Current (Traditional) 3S Framework

Examples:
- A first constructed NPP in a new nuclear country experiences a radioactive leak due to an operator error – Labeled as a “Safety” accident
- An IAEA inspection indicates missing nuclear material – Labeled as a “Safeguards” incident
- Recent attacks on a critical infrastructure prompt a national requirement for 10 foot reinforced concrete barriers around all such facilities – Labeled as a “Security” accident

Should each of these examples be addressed as a solely “Safety”, a “Safeguards”, or a “Security” accident/event/incident? Or, as a “3S” accident/event/incident?

Why Integrated 3S?
Potential Objectives for Integration of 3S

- Integrate 3S in the RNEP
  ▪ Assure consideration of impact on 3S in decision making process regarding the nuclear power program in the country
- Promote Sustainability
  ▪ Reduction in operating cost of NPP
- Increase Reliability
  ▪ Increase the collective focus on development, implementation, and improvement of 3S
- Opportunity for Cross Training of Workforce
  ▪ Enhances worker morale and retention
- Promote “System” analysis and solution approach
  ▪ Results in effective and efficient outcome
Attributes of Our Proposed Model for Integrated 3S Framework

- **Dynamic**
  - Flexible.
  - Adjust to Changes in the Conditions
- **Adaptive**
  - Able to easily (and dynamically) find the balance; focuses on integrating necessary components of culture/tools
  - Feedback capable
- **Proactive**
  - Comprehensive understanding across areas of expertise
  - Arrive at a Well Balanced System after any Event
  - Under any Condition in a Timely Manner

A “3S” Framework

**Integrated 3S**
- **Components**
  - Technical
  - Operational
- **Objectives**
  - Technical
  - Operational
- **Interactions**
  - Direct
  - Indirect