

Safety–Security Interface (SSI) at Bhabha Atomic Research Centre, Mumbai, India

Rajdeep
Bhabha Atomic Research Centre,
Mumbai, India
rdeep@barc.gov.in

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Introduction

- **The overall objective of Safety and Security is the same**
- **Regulatory body may be the same but should be subjected to different regulations.**
- **Coordination must, if two or more organizations are involved.**
- **Interface helps to capitalize on opportunities for mutual enhancements**
- **Safety and Security should complement each other.**
- **Diverging requirements of Safety and Security, but any of the two can not be addressed in isolation.**
- **Integrating safety and security is imperative and imminent.**
- **Interfacing safety and security is a challenge.**
- **Failure of one jeopardizes the purpose of other.**
- **It is prudent to integrate both safety and security.**

Challenges in Managing Safety-Security Interface

- In nuclear safety: **Sharing of information encouraged**
- **Emergency access to facilitate quick intervention in case of an emergency like fire.**
- **Two-person rule:**
- **The feedback from operating experience**
- **Proper records and evaluation of events**
- **Location of some equipment like fuel storage tanks**
- **Minimum level of fuel oil**
- **Safety requires different routes for cables and pipelines to act as back up, but security demands minimum number of penetrations.**

Guidelines followed to design robust Safety-Security Interface at BARC...1/2

- **Passive systems:** To avoid the effect of human errors and malicious acts
- **To increase protection against an insider threat:** Robustness against human errors
- **Boundaries or Barriers :** For radiation protection.
- **Unauthorized access or removal of radioactive material:** Prevented by delaying or detecting.
- **Help of safety and security experts:** To identify sensitive targets.
- **Safety and security requirements:** Commensurate with the potential hazard of the facility.
- **Graded Approach:** To finalize the nuclear safety and security requirements for siting, design, operation, utilisation, modification, training and qualification, emergency preparedness, and regulatory supervision.
- **Hazard category, scenario, proximity to population etc.** used for grading.
- **Coordination ensured in developing operating procedures.** If there are conflicts, the solution, which minimises the overall risk to the public, is picked up.

Guidelines followed to design robust Safety-Security Interface at BARC...2/2

- **Prime responsibility for the safety and security:** On the operating organisation
- **The management authority for both safety and security :** Centralised in the operator's organisation.
- **Situations that might require instantaneous response actions without the opportunity for consultation :** Identified in advance, to the extent practicable, and emergency procedures are put in place to guide such actions.
- **Regular exercises :** Conducted involving operations staff, on-site emergency response teams, radiation protection groups , the regulator, off-site response teams, the police and civil support groups.
- **During an emergency:** Safety requires unhindered two-way movement of people, like rapid egress of people from radioactive areas and rapid access for emergency response teams to assist with attending to and evacuating injured personnel.
- But, this makes the facility vulnerable to adversaries, who can damage, steal or could take hostages. So, **successive barriers are implemented for staged evacuation of personnel and access of emergency response teams.**
- **Availability of at least one access barrier :** Ensured by which neither safety nor security is compromised.

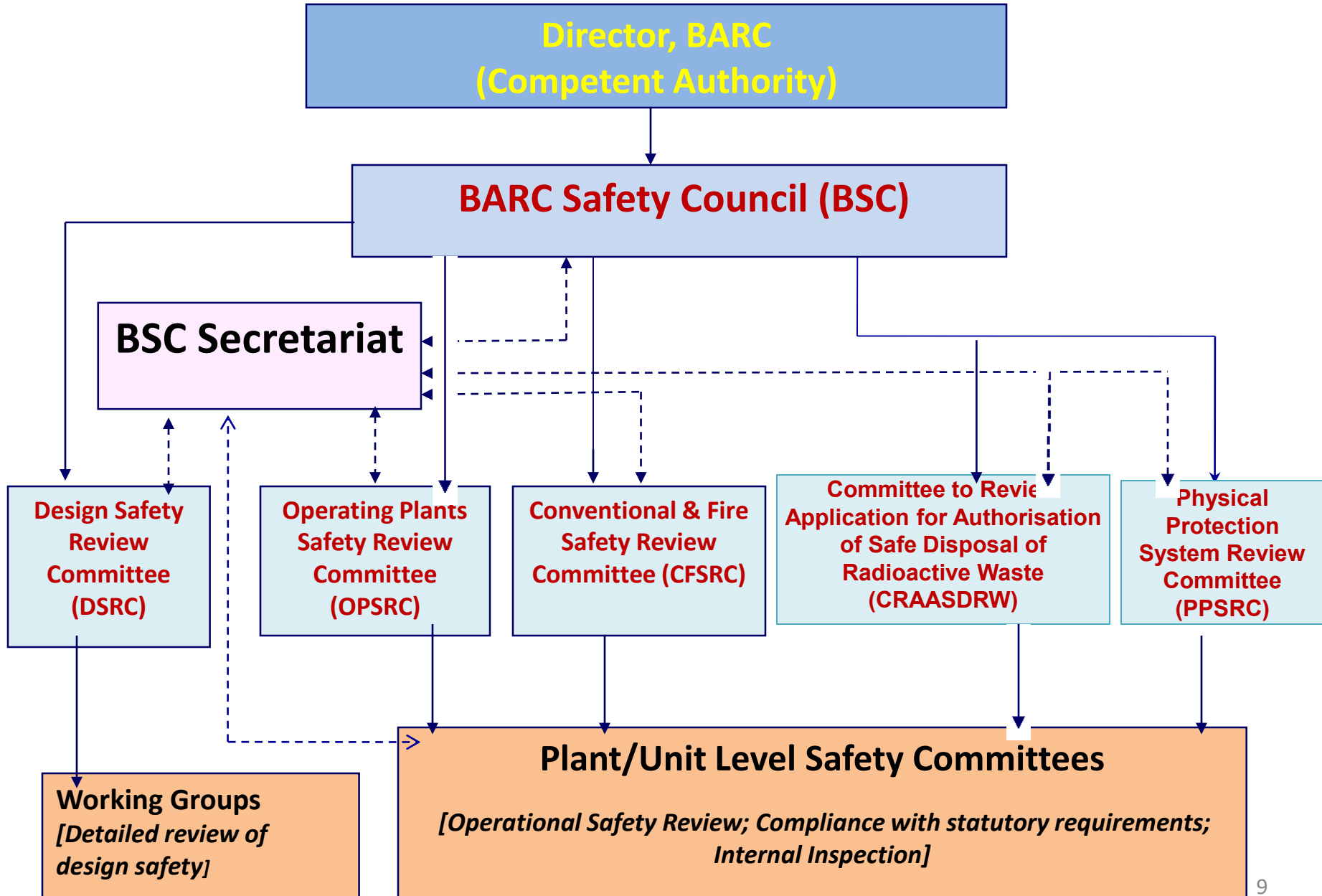
Role of Management Systems for Safety-Security Interface.....1/2

- **Aim** : Establishment of strong safety and security culture
- **Managers serve as positive role models** through their attention and adherence to the nuclear safety & security practices.
- **Establish a formal decision making mechanism** that is well understood within the organization
- **Involve their staff in decision making process** appropriately.
- Ensure that all skills and authorizations required to perform tasks relating to safety and security are in place.
- Provide training for the professional development
- Motivate staff members and recognize their role in enhancing safety and security
- Encourage questioning attitudes and personal accountability.
- **Classified information is securely segregated, stored and managed.**
- Cyber Systems are securely maintained.
- Mechanism of constructive feedback is reinforced to evolve appropriate behaviour.

Role of Management Systems for Safety-Security Interface.....2/2

- Personnel encouraged to report any event that could affect safety or security.
- **Continual improvement** in nuclear safety and security culture
- **Prevent complacency** from compromising overall safety and security objectives.
- **Analyze the Experience and events** that affect nuclear safety and security
- **Take corrective actions** and appropriate **enhancements**
- **Drills and exercises** are conducted to test the performance of safety and security systems and the human factors
- Patterns and trends arising from deficiencies are analyzed and corrections are implemented.
- **Reward** Effective performance of the personnel leading to better safety or security
- **Feedback System:** Staff consulted about the ergonomics and effectiveness of their work environment.
- Top managers periodically visit manned security posts and plants
- Pay special attention to **operations during off hours** and weekends.
- Establish appropriate physical fitness criteria for all the employees and monitor it.

3-tier BARC Safety Framework



Safety and Security Interface for New Projects...1/2

- Defence in depth, physical separation (doors & barriers), shielding, passive systems, single failure criterion, fail safe systems and alarms are implemented so as to complement safety and security.
- For each new upcoming project, a new project specific Design Safety Review Committee (DSRC) is constituted to review the design safety, including Quality Assurance in Design & Construction.
- BSC formulates facility-specific review guidelines to be followed by DSRC.
- Depending upon the requirements, DSRC constitutes Specialists Working Groups to complete the third tier review process.
- Siting has to qualify various screening criteria , which take care not only safety in long term but nuclear security also such that site characteristics are utilized both for safety and security.
- In site evaluation report, site characteristics are addressed as input for identifying the design basis threat, location of main plant boundary, isolation zone and for design of physical protection system.
- In the Safety Analysis report, one chapter covers Physical protection systems covering access control, detection, alarm and assessment; delay and physical barrier; communication; plant configuration control, response force, Training and licensing aspects and Quality assurance aspects.

Safety and Security Interface for New Projects...2/2

- For getting Construction Consent, the applicant has to submit details of physical protection system design covering design basis threats to show that:
 - Suitable technical and administrative precaution will be taken to prevent persons from carrying out unauthorized actions.
 - All safety related systems, structures and components (SSCs) located within operating island.
 - The number of penetrations minimized through main plant boundary, operating island and inner vital areas.
 - Effective provision to detect and assess any violations of these security arrangements are in place.
 - Sufficient protection provided for the safety systems which cannot be designed as fail safe.
 - Sufficient delays for intrusion.
 - Proper liaison with competent authority for timely assistance to neutralize the threat.
 - Methodology for training/certification/licensing of plant and security personnel.
 - Documentation and reporting aspects spelt out.
 - Aspects of quality assurance have been covered.
- The documents related to design and safety are reviewed by DSRC and the document on Physical Protection System is reviewed by PPSRC and its recommendations are taken into consideration by BSC for granting the stage wise consents viz. siting, excavation, construction, major equipments erection, commissioning and operation.

Safety and Security Interface for Operating Facilities

- **Operating procedures developed**
 - to ensure that activities are performed in accordance with the approved operational limits and conditions of the facility without compromising the security configuration of the facility.
 - For the mutual benefit of safety and security,
 - In consultation with safety and security experts.
- **Constant monitoring** i.e. checking safety and security systems regularly and performing preventive maintenance
- **Surveillance** includes planned activities carried out periodically
 - to verify that all items important to safety and security are capable of performing their functions as specified within the prescribed limits during normal operational states and during and following accident conditions and
 - to detect in time any deterioration which could lead to reduced reliability, ageing or any other unsafe condition.
- Each **modification proposal** is reviewed considering both safety and security aspects in a systematic manner by experts of both fields.
- In BARC, **after hot commissioning & successful operation** of the new plant for 3 months, safety review of nuclear facility is taken over by Operating Plants Safety Review Committee (OPSRC) from DSRC.
- ULSC is the interfacing agency for safety and security at lower level for the operating radiological and nuclear facilities of BARC.
- PPSRC gives recommendations to BSC and finally, BSC is the apex committee where final decision is taken and BSC acts as interface of safety and security at higher level of safety and security review mechanism of Bhabha Atomic Research Centre.

Safety and Security Interface in Use of Sealed and Unsealed Sources

- Nuclear Security and Safety is ensured during as well as after use of sealed and unsealed sources.
- BSC has strict regulatory control on the sealed as well as unsealed sources for their
 - Procurement,
 - Use,
 - Transfer and
 - Disposal.
- In the three tier safety and security framework of BARC, the Safety Review Committee for Radioactive Sources (SRC-RS) reviews the applications from various users for procurement and use of sealed and unsealed sources.
- The Committee to Review Applications for Authorization of Safe Disposal of Radioactive Waste (CRAASDRW) reviews the applications for disposal and storage of sealed as well as unsealed sources after their useful life.
- Finally at the apex level, there is interface between safety and security, before granting the final permissions and consents.

Safety and Security Interface in Transport of Radioactive Material

- There are always conflicting issues between safety and security during transport of radioactive material.
- Safety experts
 - prefer to have **warning signs on transporting vehicles.**
 - Would like to share the information with public about the strength of the source and
 - Route of the transport to avoid any unnecessary exposure, whereas
- Security experts may prefer to transport these materials without any markings as these details could be misused by adversaries.
- BSC has strict regulatory control on the transport of any radioactive material.
- In the three tier safety and security framework of BARC, the Safety Review Committee for Transport of Material (SRC-TRM) reviews the applications for transport of any radioactive material.
- Finally at the apex level, there is interface between safety and security before granting the final permission to transport any radioactive material.

Safety and Security Interface in Radioactive Waste Management....1/2

- In BARC facilities, the radioactive waste is stored in such a way that if required, it can be retrieved at any point of time, so as to
 - further process it for Partitioning of the useful isotopes or for
 - Volume reduction and
 - Better storage avenues.
- From radioactive waste generator to radioactive waste manager, the volume and activity is accounted at every stage and returns are filed to regulatory body for every transfer and disposal.
- All facilities, whether radioactive waste generator or radioactive waste manager, are well secured and have same level of physical protection systems in place.
- Each radioactive waste generator stores the segregated radioactive waste temporarily in such a way that it does not result into any additional radiation exposure to the plant personnel and it is easy to handle in case of its transfer to radioactive waste manager.
- No radiological and nuclear facility is allowed to dispose radioactive waste directly to environment.

Safety and Security Interface in Radioactive Waste Management...2/2

- Application of each facility to transfer the radioactive waste to waste manager is reviewed by respective ULSC and then submitted to CRAASDRW.

CRAASDRW

- Examine the adequacy of the information provided in prescribed form by the applicant;
- Assess the capability of the installation for direct disposal of radioactive waste and/or the need for its transfer to a waste management agency;
- Recommend to the Chairman, BSC regarding any stipulation in addition to those existing in the prescribed form under the rules for authorization;
- Review returns of radioactive wastes, disposal/ transfer submitted by authorised BARC installations periodically;
- Recommend to Chairman, BSC renewal/ revocation/ amendment of authorizations issued to BARC installations for safe disposal/ transfer of radioactive wastes;
- Review reports of inspections regarding safe disposal / transfer of radioactive wastes at the respective installations;
- So, at ULSC level as well as BSC level, there is an interface between safety and security for radioactive waste.
- Finally authorization to transfer any radioactive waste is granted by Chairman, BSC based on the recommendations of CRAASDRW.

Safety-Security Interface during Emergency Preparedness and Response...1/2

- Though responsibility of safety and security rests with the operator, **during emergency operator alone cannot ensure protection.**
- Therefore, involvement of State is broader and larger for security than safety.
- There is direct involvement of the State in the assessment of threats.
- State and operator ensure that security measures are adequate to the threat level as threats are evolving.
- **Management of emergency associated with a security event requires involvement of more agencies, compared to safety.**
- During normal conditions, access is controlled for security purposes and the area is subjected to special physical protection system.
- But during emergency, facilitated access is needed for emergency teams and it needs accesses for evacuation of personnel and faster transport as per safety procedures, while transport should be minimised for security purposes.
- In case of security related event, the emergency response also intends to catch the adversary.
- **Safety and Security Plans should be complementary and coherent and should be tested during general emergency exercises.**

Safety-Security Interface during Emergency

Preparedness and Response....2/2

- A terrorist act may demand the involvement of more State bodies than that from a safety event.
- **Safety measures** on-site under the operator's responsibility will need to be taken to minimise or mitigate potential consequences.
- **Security measures** will focus on the neutralisation of the adversaries, for preventing further damage and protecting emergency personnel.
- These **actions are coordinated** as per guidelines in place and differences are ironed out by joint training exercises and incorporating lessons learnt.
- **Emergency plans are developed** in consultation with security specialists and it is ensured that security measures are maintained during emergency situation.
- **Centralised decision making management chain** is adopted and the contingency plan allows the parallel and complementary execution of the radiological emergency plan to recover from an associated radiological release.
- **Situations warranting instantaneous response actions** without the opportunity for consultation are identified in advance.
- **The first action of security forces is to neutralise the adversaries** and then to consider potential safety.
- Operator is consulted and safety risks advice is taken.
- It is ensured that activities of the security forces do not jeopardise safety and also security is not jeopardised during implementation of safety measures.
- An emergency event, such as a fire alarm or health crisis, could be used by an adversary to initiate a security event.

Conclusion

- Since a security incident can turn into a safety disaster, **Safety and Security culture should co-exist** and reinforce each other.
- **Mutual guidance for the harmonization of concepts and attitudes** is required.
- The common vulnerabilities in safety–security are lack of procedures, training, communication, strategy, legal framework and required equipments.
- Although there are checks and balances in maintaining the harmony between the requirements of safety and security, yet a fine balance is maintained by developing an interface between safety and security for each and every activity of BARC.
- An holistic approach is followed, whenever the safety overrides the security and vice versa.
- By an effective and efficient interface, complementary and conflicting aspects of safety and security are examined and solutions are brought out in such a way that **all activities are carried out in an integrated and coordinated manner**, so that **desired levels of both safety and security** are achieved.
- Interface ensures that **no compromise is made** from prescriptive safety and security, whenever a modification is implemented in the facility.
- Safety and Security cultures are actively promoted and coordinated by management in order to successfully interface safety and security at BARC facilities.

Thank You