IAEA
International Atomic Energy Agency

REPORT

Workshop on Managing the Interface between Safety and Security of Research Reactors

(EVT2101785)

Date 6-10 June 2022
Vienna, Austria

CONTENTS

1. BACKGROUND

Member States and their operating organizations are responsible for the safety and security of their research reactors. To assist them, the International Atomic Energy Agency (IAEA) is implementing projects aimed at enhancing the operational safety and the security of research reactors, including those which are under project and supply agreements. For research reactors and the associated materials and sites, there are specific safety and security issues, including the proximity of some facilities to populated areas and their accessibility to users from outside the operating organizations. Effective communication and coordination are essential to ensure that adequate safety measures and security measures are established at research reactors. Nuclear safety and nuclear security share the same ultimate goal, which is the protection of people and the environment from the harmful effects of ionizing radiation. Managing the interface between safety and security for a research reactor needs to be addressed in an integrated manner throughout the lifetime of the facility, to ensure that security measures and safety measures do not compromise one another. The IAEA publishes safety standards and nuclear security guidance to support Member States in achieving high levels of safety and security of research reactors. To aid Member States in developing a coordinated approach to safety and security, in 2016 the IAEA published Management of the Interface between Nuclear Safety and Security for Research Reactors (IAEA-TECDOC-1801). The development of the publication was supported in part by previous IAEA workshops and Technical Meetings dealing with this subject. Feedback from the IAEA's activities on research reactors, including safety review missions and Technical Meetings, indicate a need to reinforce and further enhance Member States' awareness and management of the interface between safety and security at research reactors. Additionally, the positive reception of TECDOC-1801 has highlighted the research reactor community's continued interest in this topic. In this context, the IAEA organized this virtual Regional Workshop on Managing the Interface between Safety and Security for Research Reactors from 6-10 June 2022.

2. OBJECTIVES

The objective of the workshop was to provide the participating Member States with practical information to better understand and manage the interface between safety and security of research reactors. The workshop also served as a forum for sharing information and exchanging knowledge and experience among the participating Member States on strategies to manage the interface between safety and security at research reactors.

3. WORKSHOP PARTICIPANTS

The workshop was attended by 19 participants from 7 Member States which are operating one or more (or planning to have their first or a new) research reactors. Among the participants were: managers of research reactor operating organizations and regulatory bodies; safety, security and operational specialists from operating organizations; and regulators responsible for the safety and security of research reactors. The participants represented research reactors with a wide range of reactor types, sizes, utilization programmes and safety and security risks. The complete list of participants is provided in Annex I of this report.

The Scientific Secretaries of the workshop were Mr D. Sears of the Research Reactor Safety Section (RRSS) of the Division of Nuclear Installation Safety (NSNI), and Mr A. Shakoor from the Division of Nuclear Security (NSNS). Mr Jason Chakovski (Australia) was selected to be the Chair of the workshop, and Mr Abdul Malek Soner (Bangladesh) was selected to be the workshop rapporteur.

4. CONDUCT OF THE WORKSHOP

Mr Kristof Horvath from IAEA Division of Nuclear Security opened the workshop and highlighted Agency's coordinated approach to address the safety and security of nuclear installations, including research reactors. He addressed the feedback from different IAEA conferences, technical meetings, peer review missions, training courses and workshops highlighting the importance of interface management and a need for further guidance on how to meet the safety requirements established in the IAEA Safety Standards Series and the recommendations established in the IAEA Nuclear Security Series in a harmonized, holistic and complementary manner. Mr. Horvath also gave a short overview on an on-going activity to develop a Safety Guide and Implementing Guide DS533/NST067 on the Management of the interfaces between nuclear and radiation safety and nuclear security.

The opening session also included remarks from the Scientific Secretaries on the purpose and planned programme of the workshop and the desired outcomes. The Scientific Secretaries expressed the importance of harmonizing safety and security considerations throughout the lifetime of a research reactor facility and the expectation that the IAEA will facilitate this goal through coordination internally and with Member States in the development of standards, recommendations and guidance for research reactor safety and security.

The workshop consisted of presentations from the IAEA representatives, from the participants, and working group discussions. The workshop agenda is provided in Annex II of this report.

The presentations from the IAEA representatives covered the following topics:

- Interface between safety and security of research reactors;
- International legal instruments on nuclear safety and security;
- Nuclear security issues and trends and programmes for research reactors;
- Interface issues between nuclear safety and nuclear security cultures;

- Safeguards aspects associated with research reactors;
- IAEA-TECDOC-1801 on management of the interface between safety and security of research reactors;
- Nuclear safety and security interface aspects of digital I&C systems; and
- The interface between safety and security in response to a radiological emergency.

The meeting participants made presentations covering the safety and security status of the research reactors in their organizations, regulatory supervision for safety and security, and various aspects of management of safety and security. The presentations also included national practices and experience regarding managing the interface between safety and security for research reactors. These presentations led to useful discussions between the participants of topics related to research reactor safety and security and the interface between them. The major topics of discussions included:

- The traditional organisational separation of reactor operations and security and the effect that this has on the interface between safety and security;
- Managing the safety and security interface in ways that can be mutually supportive for each other;
- Managing safety and security issues in a manner such that neither is considered as a priority over the other but they complement each other;
- Managing security in a way that does not impair or degrade emergency response;
- Application of the graded approach to the safety and security interface;
- Cultural differences in that safety culture is typically transparent whereas security culture tends to be confidential;
- Safety culture and security culture and methods for their self-assessments;
- Combined periodic safety and security review;
- Security consequence assessment and feeding this into emergency planning;
- Combining security and safety in emergency exercises;
- Taking lessons learnt in the interface between safety and security and using this information for future facilities;
- Security systems, arrangements and recent upgrades;
- Lessons learnt from cyber attacks;
- Emergency planning and contingency planning, including coordinated response functions and external response organizations;
- Regulatory inspections of safety and security and methods for coordinating inspection programmes;
- Knowledge sharing and cross-training between safety and security organizations; and
- Safety and security considerations related to facility modifications and utilization programmes, including access to the facility by outsiders such as researchers and contractors;

The presentations made by the IAEA representatives and the participating Member States and the other workshop materials are available on a webpage in the Research Reactor Information Network, to which all participants have access.

On Wednesday 8 June the participants were divided into three working groups, and on Thursday 9 June the groups worked independently on the exercises. The working group sessions focussed on the importance of management controls and processes, technical attributes and expertise for change analysis to ensure that proposed changes and associated activities will not adversely affect compliance with safety and security requirements, or reduce the relevance of safety analyses, operational limits and conditions or the approved security plan. Activity 1 involved a case for the change to existing security system that required consideration of analysing the impact to safety whereas Activity 2 involved a case for the change to the safety with consideration of analysing the impact to security. Activity 3 involved a Hypothetical Atomic Research Institute and analysis of its systems for physical protection, access control, trustworthiness, information security, security management and materials on site and to suggest possible improvements. The scope of the working group activities was to analyse the interface between safety and security using three case studies.

The description of the working group activities is included in Annex III of this report.

The results of the working groups were presented and discussed in a plenary session on Friday 10 June. The conclusions and recommendations of the working groups formed part of the workshop's conclusions and recommendations, which were presented by the workshop's Chair and agreed upon during the closing session of the workshop. They are presented below.

5. SUMMARY OF THE CONCLUSIONS AND RECOMMENDATIONS

The main conclusions and recommendations of the workshop, which are based on the participants' presentations, working group activities and general discussions among the participants, are summarized in the following paragraphs.

5.1. General

Various sessions of the Workshop provided an opportunity for the participants from regulatory and operating organizations to share their knowledge and experience, good practices, innovative methods and approaches to manage interfaces between safety and security of research reactors. Additionally, the group activities provided a good forum to the participants from regulatory and operating organizations to interact and understand each other's perspectives despite some participants' connection issues that constrained the virtual meeting.

5.2. IAEA-TECDOC-1801

It was noted in many workshop discussions that IAEA-TECDOC-1801 is an excellent source of information on managing the interface between safety and security. It was agreed that the practical case studies provided in Annex 1 are useful to understand the challenges in managing the interface between safety and security and how they can be managed. One of the member states reported that IAEA-TECDOC-1801 was used as a primary resource during a recent Periodic Safety and Security Review (PSSR).

Recommendation 1: Operating organizations and regulators are encouraged to use TECDOC-1801 for guidance for managing the interface between safety and security and training of their staff.

5.3. External response organizations

A number of presentations addressed the importance of communication means, procedures and compatibility as interface issues with external response organizations responsible for contingency and emergency response. They also highlighted the need for their familiarity with on- and off-site response operations, chain of command, facility related layouts, targets and hazards.

Recommendation 2: Appropriate trainings should be organized for the external response organizations on radiological safety and such organizations should participate in joint training exercises to incorporate lesson learned in their response plans.

5.4. Safety and security cultures

While addressing the safety and security cultures, participants noted that safety and security are often in differing organisational departments, and safety culture tends to be very open whereas security culture is typically on a need-to-know basis resulting in cultural challenges. These cultural challenges can be mitigated somewhat through regular communication and engagement between reactor and security staff.

Recommendation 3: Operating organisations are encouraged to establish routine and ongoing communications opportunities between facility management and security establishments in order to harmonise cultural differences between safety and security.

5.5. Regulatory activities related to the safety-security interface

Some presentations by participants noted that some of the regulatory bodies integrated their safety and security oversight activities while other regulatory bodies either had separate organizations for safety and security regulation or different parts within the regulatory body performed completely separate safety and security functions or tasks without an adequate interface.

Recommendation 4: Regulatory programmes for inspection and licensing for nuclear safety and nuclear security should be coordinated under a safety-security interface management framework at the regulator(s). For inspections, this could include joint safety and security inspections, to the maximum extent practicable.

5.6. Future IAEA activities on the interface between nuclear safety and security

Ongoing activity to develop the new Safety and Implementing guide, DS533/NST067, has been in progress. The objective of the publication is to provide overarching guidance on managing the interfaces between nuclear and radiation safety and nuclear security so as to ensure that safety measures and security measures are designed and implemented in a coordinated manner. This will facilitate the implementation of the relevant requirements of the IAEA Safety Standards Series and recommendations of the IAEA Nuclear Security Series.

Recommendation 5: The IAEA should continue to organize biennial workshops on management of the interface between safety and security.

ANNEX I: LIST OF PARTICIPANTS

No.	Last Name	First Name(s)	Country/Organization
1	**Chakovski**	Jason Stephen	Australia
2	**Lucas**	Katherine	Australia
3	**Soner**	Md Abdul Malek	Bangladesh
4	**Yasintha**	Niniek Ramayani	Indonesia
5	**Roswita**	Fahma	Indonesia
6	**Widiawati**	Nina	Indonesia
7	**Trianti**	Nuri	Indonesia
8	**Sukarno**	Diah Hidayanti	Indonesia
9	**Husain**	Mohamad Annuar Assadat	Malaysia
10	**Roslan**	Ridha	Malaysia
11	**Azores**	Romelda	Philippines
12	**Dela Cruz**	Rafael Miguel	Philippines
13	**Gregorio**	Eugene	Philippines
14	**Hernandez**	Eileen Beth	Philippines
15	**Valdez**	Francis Cyril	Philippines
16	**Rivers**	Joseph	United States of America
17	**Nguyen**	Hoang Anh	Viet Nam
18	**Tran**	Vinh Thanh	Viet Nam
19	**Vo**	Dang Doan Hai	Viet Nam

ANNEX II: AGENDA

Workshop on Managing the Interface between Safety and Security of Research Reactors
6-10 June 2022, Vienna, Austria

Monday	
Time	**Topic**
09:30 – 10:00	**Opening Remarks: Workshop Objectives and Expected Results** Mr K. Horvath, Unit Head, NSNS/MAFA. **Administrative Matters***:* • Scientific Secretaries (Mr D. Sears, IAEA/NSNI; Mr A. Shakoor, IAEA/NSNS); • Selection of Workshop Chairman and Rapporteurs; • Adoption of the agenda.
10:00 – 10:30	**International Legal Instruments on Nuclear Safety and Security** *Presenter:* Mr. A. Wetherall (IAEA/OLA)
10:30 – 11:15	**The Interface between Nuclear Safety and Security for Research Reactors** *Presenter:* Mr D. Sears (IAEA/NSNI)
11:15 – 11:45	**Coffee Break**
11:45 – 12:30	**IAEA Nuclear Security Programme for Research Reactors** *Presenter:* Mr A. Shakoor (IAEA/NSNS)
12:30 – 13:00	**Regulatory Practices to Manage the Interface Between Nuclear Safety and Nuclear Security** *Presenter:* Mr Hatem Khouaja, Z.H. Shah (IAEA/NSNI)

Tuesday	
Time	**Topic**
09:00 – 09:45	**US Experience on Management of the Interface between Safety and Security for Research Reactors** *Presenter:* Mr Joe Rivers (USA Nuclear)
09:45 – 10:30	**Interface Issues between Nuclear Safety and Nuclear Security Cultures** *Presenter:* Ms Iva Kubanova (IAEA/NSNI*)*

10:30 – 10:50	**Coffee Break**
10:50 – 12:00	**Country Presentations** • **OPAL Periodic Safety and Security Review: Safety and Security Interfaces**, Katherine Lucas, PSSR Project Manager, Australia • **Status of Nuclear Safety and Security Management of the BAEC TRIGA Research Reactor**, Mr Md. Abdul Malek Soner, BAEC, Bangladesh
12:00 – 12:30	**Safeguards Aspects of Research Reactors** *Presenter:* Mr K. Swan (IAEA/SGCP)
12:30 – 13:00	**Nuclear Safety and Security Interface Aspects of Digital Systems for Research Reactors** *Presenter:* Mr A. Duchac (IAEA/NSNS)

Wednesday	
09:00 – 09:30	**The interface between safety and security in the response to nuclear or radiological emergencies** *Presenter:* Ms Stacey Horvitz (IAEA/IEC)
09:30 – 10:30	**Country Presentations** • **Safety and Security Interface in the Philippine Research Reactor – 1 (PRR-1) Facility** Rafael Miguel M. Dela Cruz*, Eugene S. Gregorio, DOST-Philippine Nuclear Research Institute, Philippines • **Safety and Security Interface: The Implementation on the Transport of Nuclear Materials and Radioactive Sources in Indonesia** Niniek Ramayani Yasintha, BAPETEN, Indonesia
10:30 – 11:00	**Coffee Break**
11:00 – 12:00	**Country Presentations** • **Safety-Security Interfaces at TRIGA PUSPATI Research Reactor** Mr. M. A. A. Husain, Senior Assistant Director, Nuclear Installation Division, AELB, Malaysia. • **Safety and Security for Research Reactors in Viet Nam**

	Mr. Tran Vinh-Thanh, Viet Nam Agency for Radiation and Nuclear Safety, Viet Nam.
12:00 – 13:00	**Introduction to the Working Group Sessions** *Presenters*: Mr A. Shakoor (IAEA/NSNS) Mr D. Sears (IAEA/NSNI) Mr J. Rivers (USA Nuclear) - **Description of exercises, Allocation of working groups** **Working Group Discussions**

Thursday	
09:00 – 09:30	**Management of the Interface between Safety and Security for Research Reactors: IAEA TECDOC-1801** **Presenter: Mr Joe Rivers (USA Nuclear)**
09:30 – 11:00	• **Working Group Discussions**
11:00 – 11:30	**Coffee Break**
11:30 – 12:00	• **Working Group Discussions (cont.)**
12:00 – 13:00	**Working Group Interim Presentations (10 min each)** *Presenters:* Working Group Rapporteurs **Feedback and comments Working Group Interim Presentations** - all

Friday	
09:00 – 11:00	**Working Group Presentations (30 min each)** *Presenters:* Working Group Rapporteurs
11:00 – 11:30	**Coffee Break**
11:30 – 12:30	**Presentation on the Chairman's Report and Summary and Conclusion of the Workshop** *Presenter:* Workshop Chairman
12:30 – 13:00	**Closing of the Workshop** *Presenters:* Mr D. Sears (IAEA/NSNI) Mr A. Shakoor (IAEA/NSNS)

ANNEX III: WORKING GROUP ACTIVITIES

Working Groups

Working Group 1		**Working Group 2**	
Name	**Country**	**Name**	**Country**
Mr Vinh-Thanh Tran	Viet Nam	Mr Hoang-Ahn Nguyen	Viet Nam
Mr Eugene Gregorio	Philippines	Ms Romelda Azores	Philippines
Mr Rafael Miguel M. Dela Cruz	Philippines	Mr Francis Cyril Valdez	Philippines
Mr Mohammad Annuar Assadat Husain	Malaysia	Mr Jason Chakovski	Australia
Ms Hidayanti Sukarno Diah	Indonesia	Ms Widiawati Nina	Indonesia
Ms Roswita Fahma	Indonesia	Ms Niniek Yasintha	Indonesia
Working Group 3			
Name	**Country**		
Mr Doan Hai Dang Vo	Viet Nam		
Mr Md. Abdul Malek Soner	Bangladesh		
Ms Eileen Beth Hernandez	Philippines		
Mr Ridha Rosalan	Malaysia		
Ms Katherine Lucas	Australia		
Ms Trianti Nuri	Indonesia		

ANNEX IV: WORKING GROUP PRESENTATIONS

Group 1

Mr. Vinh-Tanh Tran
Mr. Eugene Gregorio
Mr. Rafael Miguel Dela Cruz
Mr. Mohammad Annuar Assadat Husain
Ms. Hidayanti Sukarno Diah
Ms. Roswita Fahma

Facilitator: Mr. Abdul Shakoor

Objective

- To understand importance of management control and process, technical attributes, and expertise for *change analysis*
- To ensure that proposed changes, and the activities will not adversely affect compliance with safety or security requirements

Case 1

- The small university research reactor needs to enhance physical protection system in response to plans to increase the maximum licensed reactor power from 500 kW to 3 MW.
- The security manager has proposed a modification to add a security fence around a portion of the exterior of a multipurpose building housing the reactor, several classrooms, a utility room, and faculty offices.
- In addition to the fence, several interior security doors will be required to segregate the reactor and the utility room from the classrooms and offices.

Case 1

- Specific performance criteria have to be met in order for the exterior fence to meet the requirements of a security barrier.
- One requirement is that the fence posts have to be at least 2.3 meters underground and set in concrete.
- Furthermore, the increased safety requirements that become necessary to license the reactor for operation at 3MW will increase the importance of the electrical power and water supplies.
- The building services (electrical power, water, and heating steam) enter the building underground through the utility room. Therefore, the utility room needs also to be provided with additional physical protection.

Question 1

- Could the proposed change result in an increase in the frequency of occurrence of an accident previously evaluated in the facility safety analysis?

-No

-It is need to understand that the enhancements of security features in the facility will not compromise the safety in the area where these upgrades will be applied. (e.g. access to interior security doors).

-The upgrades in PPS will be on the Security group. For the evaluation of safety interface of the upgraded PPS will be on the safety group with collaboration of the engineering group in the case of the utility room.

-These concerns should be communicated by the Reactor Manager addressing both security and safety concerns on the proposed upgrades of the PPS.

Question 2

Could the proposed change increase the risk of exposure to staff?

-Yes

-a strong understanding in the importance of radiation protection, principles (TDS, JOL, ALARA), dose calculations etc.

-the radiation protection group and safety group

-the reactor manager should be the one to communicate concerning the safety of the staff.

-Perhaps, to explain the changes of procedures in accessing the facility, restrictions in some areas that are previously controlled or supervised areas. awareness of dose in reference to dose calculations done by radiation protection group.

Question 3

- Could the proposed change create a possibility for a malfunction of a structure, system or component important to safety with a different result than from any previously evaluated in the facility safety analysis?

-Yes

-The configuration and purpose of structures, systems, and components and the safety analyses and the operational limits and conditions,

-Engineers, reactor physics group, and operators.

-Perhaps, the reactor manager and the safety group.

-a review of the safety analysis report accounting the change in power.

-asses the limit of the operation (reactor physics parameters) and to make sure that it will not exceed.

-establishing new procedures in relating to operation the facility.

Case 2

- A modification to a 20 MW research reactor has been proposed by the operations manager which would include a chemical storage tank and a chemical injection system for adding corrosion inhibiting chemicals to a cooling tower.
- The cooling tower's safety function is to provide a heat sink for decay heat removal following operational transients and under accident conditions.
- The cooling tower is experiencing accelerated corrosion that could soon render the cooling tower inoperable if not corrected.

- The placement of the chemical storage tank is within the protected area, in an area with easy access for the chemical delivery vehicle.
- The placement of the tank will obstruct the view of the research reactor security personnel and may interfere with the detection of unauthorized personnel in the protected area.
- Additionally, the delivery vehicle will further obstruct observation of the outermost security physical barrier when making routine deliveries, which occur once a week and require about one hour.

Case 2

Could the proposed change or activity decrease the reliability or availability of a security system to perform its intended functions?

-Yes

-understanding of the physical layout of the facility and the layout of security layers in the facility and to consider the chemical safety as well.

-Security group, safety group, and engineers,

-It should be communicated by the operations manager together with the reactor manager

-Planning and consultation with the safety and security groups and the engineers on the proposed installation of the chemical tank.

-Reassessment of the appropriateness of the area to hold and store chemicals.

Activity 3: HARI

- General Description
  - The Hypothetical Atomic Research Institute (HARI) was established to serve as the State's premier nuclear energy research facility. HARI is operated by the State's National Academy of Science (NAS) and is engaged in many research activities.
  - HARI's purpose is to build scientific expertise and capacity for the country. The Institute houses a research reactor facility, radioisotope production facility, fuel element fabrication facility, gamma irradiation facility, waste processing and storage facility, and administrative and facility support facilities.
  - HARI's 10 MW Research Reactor (RR) is a multi-purpose open-pool-type reactor. It has been designed primarily for:
    - Production of molybdenum-99 (99Mo)
    - Neutron-beam experiments
    - Neutron-activation analysis
    - Material testing of MOX fuel prototypes

Activity 3: HARI

- The Fuel Fabrication Facility (FFF) manufactures low-enriched uranium (LEU) fuel for the Research Reactor.
- The Gamma Irradiation Facility (GIF) provides commercial sterilization of many products, primarily for the medical and food services industries.
- The Radioisotope Production Facility (RPF) processes irradiated targets that are used to produce several medical and industrial radioisotopes, primarily 99Mo.
- The Centralized Waste Processing Facility (CWPF) and Interim Storage Facility (ISF) receive radioactive and nuclear waste from the various facilities on the HARI complex and process them for safe storage. This waste includes target foils and filters from 99Mo production.
- The HARI site is located in the nation's capital, which is a modern metropolis of two million inhabitants that contains major roadways, a rail system, both a private and a military airport, and a limited waterway.
- HARI was originally located in a remote area on the outskirts of the capital, but over time residential areas, businesses and university buildings were constructed around it. Today, HARI is at the centre of a thriving research park and business community in a residential suburb

Activity 3: HARI

- The nation's capital is located in a high elevation, semi-arid environment. The vegetation consists of small shrubs, cacti, hardy desert trees, and grasses. Small animals, such as rabbits, squirrels and foxes inhabit the area. Birds of all sizes are present. The climate is a typical high-desert environment with approximately 300 clear days of bright sunshine per year. On cloudy days, some areas have a high light-to-dark ratio because of moving cloud shadows. Rainfall is approximately 15 cm per year, with the majority occurring during seasonal thunderstorms in the late summer rainy season. The spring season is typically very windy for two to three months, with continuous winds of 2 to 5 km/hr and gusts of up to 50 km/hr. Dry debris, dust and dead vegetation are blown about during the windy season.

HARI Appendix 11 and 12

- In terms of safety and security, it is enough, don't need any additional features.
- Based on the facility layout, it has enough double fence, turnstile, etc.
- Support instruments is also enough.
- In Appendix 12: Access Control, It mentioned this statement:

  This appendix does not discuss access control equipment (locks, keys, badges and readers, etc.). Nor does it discuss prohibited item detection equipment. Access and equipment is part of the physical protection system and is described in Appendix 11, Physical Security.

However, this discussion is present in this appendix.

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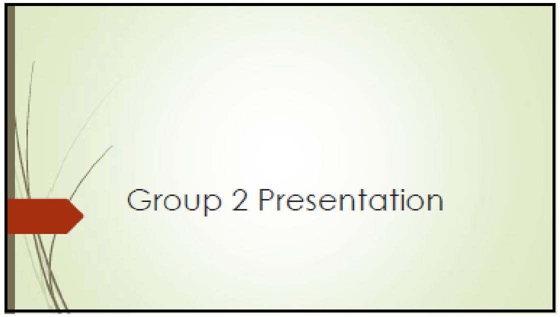
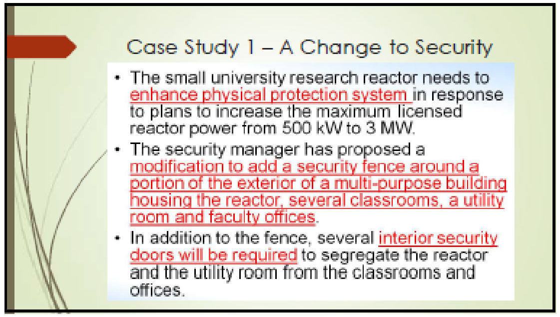

Group 2 Presentation

1


Case Study 1 – A Change to Security
The small university research reactor needs to enhance physical protection system in response to plans to increase the maximum licensed reactor power from 500 kW to 3 MW.
The security manager has proposed a modification to add a security fence around a portion of the exterior of a multi-purpose building housing the reactor, several classrooms, a utility room and faculty offices.
In addition to the fence, several interior security doors will be required to segregate the reactor and the utility room from the classrooms and offices.

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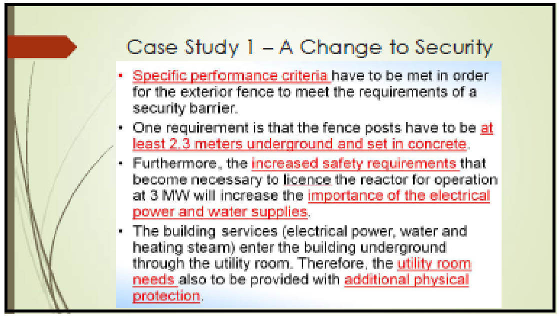
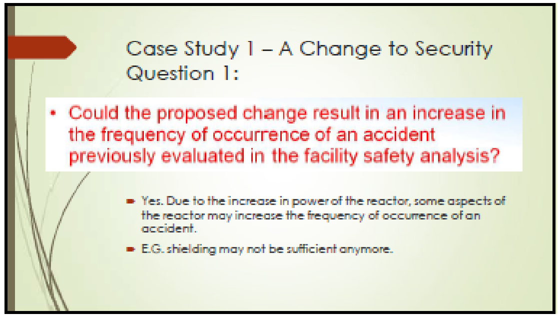
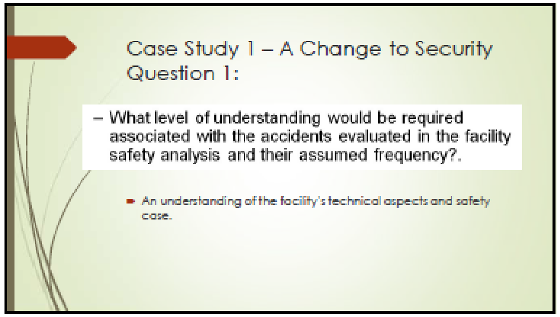

Case Study 1 – A Change to Security
Specific performance criteria have to be met in order for the exterior fence to meet the requirements of a security barrier.
One requirement is that the fence posts have to be at least 2.3 meters underground and set in concrete.
Furthermore, the increased safety requirements that become necessary to licence the reactor for operation at 3 MW will increase the importance of the electrical power and water supplies.
The building services (electrical power, water and heating steam) enter the building underground through the utility room. Therefore, the utility room needs also to be provided with additional physical protection.

3


Case Study 1 – A Change to Security
Question 1:
Could the proposed change result in an increase in the frequency of occurrence of an accident previously evaluated in the facility safety analysis?
Yes. Due to the increase in power of the reactor, some aspects of the reactor may increase the frequency of occurrence of an accident.
E.G. shielding may not be sufficient anymore.

4


Case Study 1 – A Change to Security
Question 1:
– What level of understanding would be required associated with the accidents evaluated in the facility safety analysis and their assumed frequency?.
An understanding of the facility's technical aspects and safety case.

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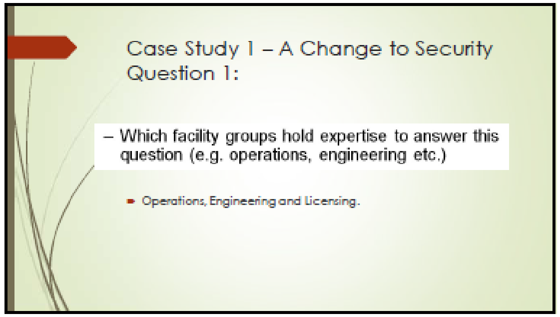
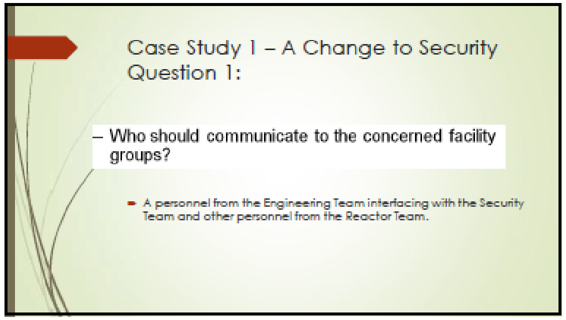
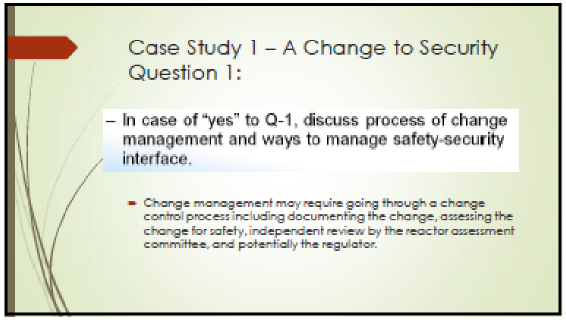

Case Study 1 – A Change to Security
Question 1:
– Which facility groups hold expertise to answer this question (e.g. operations, engineering etc.)
Operations, Engineering and Licensing.

6


Case Study 1 – A Change to Security
Question 1:
– Who should communicate to the concerned facility groups?
A personnel from the Engineering Team interfacing with the Security Team and other personnel from the Reactor Team.

7


Case Study 1 – A Change to Security
Question 1:
– In case of "yes" to Q-1, discuss process of change management and ways to manage safety-security interface.
Change management may require going through a change control process including documenting the change, assessing the change for safety, independent review by the reactor assessment committee, and potentially the regulator.

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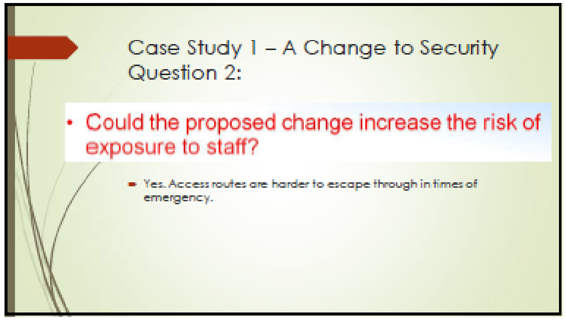
Case Study 1 – A Change to Security
Question 2:
• Could the proposed change increase the risk of exposure to staff?
Yes. Access routes are harder to escape through in times of emergency.

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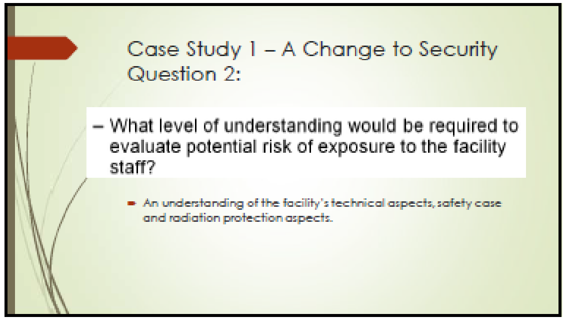
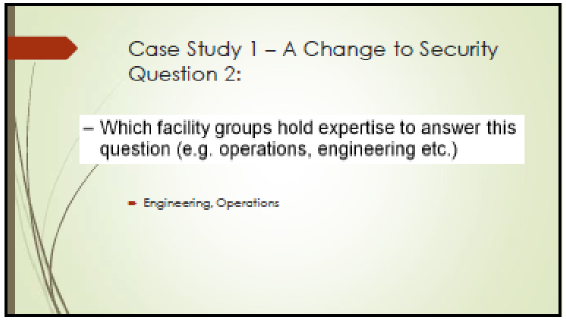
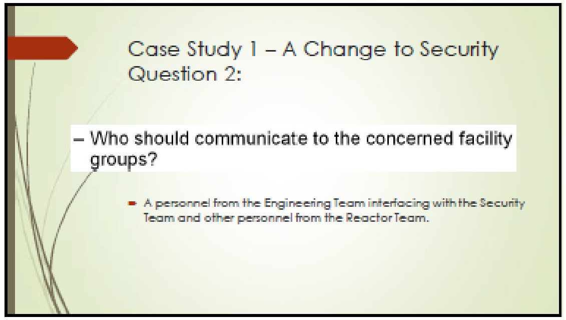

Case Study 1 – A Change to Security
Question 2:
– What level of understanding would be required to evaluate potential risk of exposure to the facility staff?
An understanding of the facility's technical aspects, safety case and radiation protection aspects.

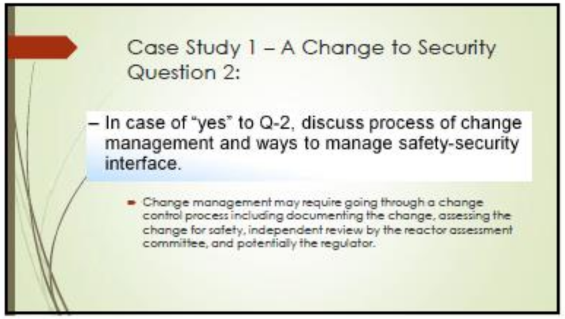
10


Case Study 1 – A Change to Security
Question 2:
– Which facility groups hold expertise to answer this question (e.g. operations, engineering etc.)
Engineering, Operations

11


Case Study 1 – A Change to Security
Question 2:
– Who should communicate to the concerned facility groups?
A personnel from the Engineering Team interfacing with the Security Team and other personnel from the Reactor Team.

12



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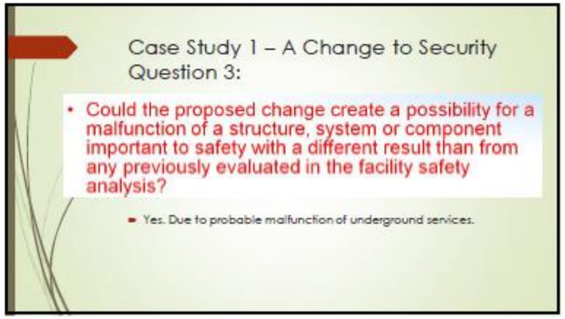

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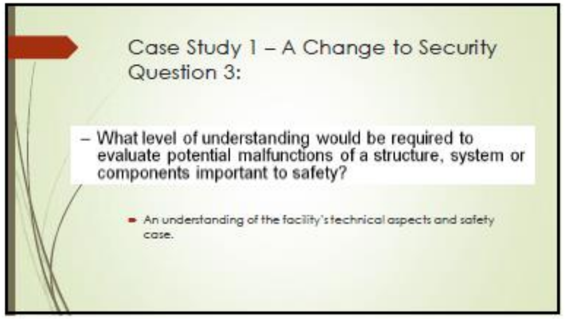

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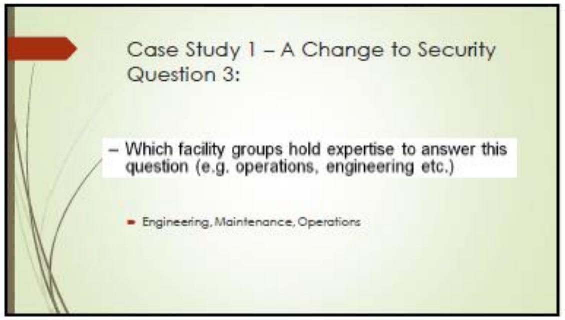

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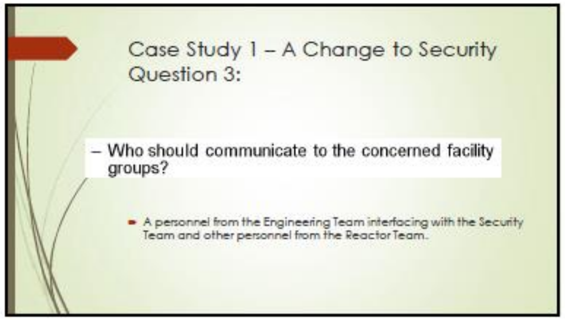

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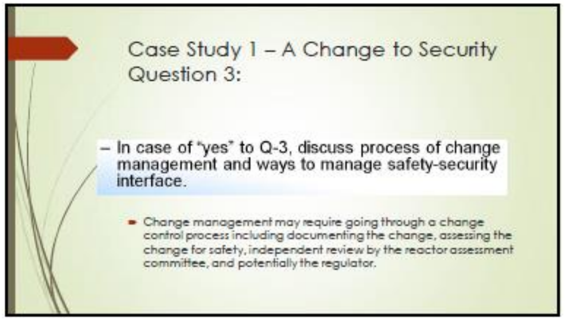

18

Case Study 2 – A Change to Safety

- A modification to a 20 MW research reactor has been proposed by the operations manager which would include a chemical storage tank and a chemical injection system for adding corrosion inhibiting chemicals to a cooling tower.
- The cooling tower's safety function is to provide a heat sink for decay heat removal following operational transients and under accident conditions.
- The cooling tower is experiencing accelerated corrosion that could soon render the cooling tower inoperable if not corrected.

19

Case Study 2 – A Change to Safety

- The placement of the chemical storage tank is within the protected area, in an area with easy access for the chemical delivery vehicle.
- The placement of the tank will obstruct the view of the research reactor security personnel and may interfere with the detection of unauthorized personnel in the protected area.
- Additionally, the delivery vehicle will further obstruct observation of the outermost security physical barrier when making routine deliveries, which occur once a week and require about one hour.

20

Case Study 2 – A Change to Safety Question 1:

- Could the proposed change or activity decrease the reliability or availability of a security system to perform its intended functions?
  - Yes. Due to obstruction of view from the new equipment and the delivery truck. The delivery truck can also be used to hide explosives.

21

Case Study 2 – A Change to Safety Question 1:

– What level of understanding would be required to evaluate the impact of the proposed safety change on the reliability and the availability of security systems?

- Facility Layout, Security Systems, Structure Systems and Components, Security Plan and Procedures, External response units e.g. Police, Fire Department.

22

Case Study 2 – A Change to Safety Question 1:

– Which facility groups hold expertise to answer this question (e.g. operations, engineering etc.)

- Security Team, Operations Team, Engineering Team

23

Case Study 2 – A Change to Safety Question 1:

– Who should communicate to the concerned facility groups?

- Operations manager

24

Case Study 2 – A Change to Safety Question 1:

– In case of "yes" to Q-1, discuss process of change management and ways to manage safety-security interface.

- Change management may require going through a change control process including documenting the change, assessing the change for safety, independent review by the reactor assessment committee, and potentially the regulator.

25

Activity 3: Comment on **Trustworthiness** and Information Security

- The HARI facility has various areas with different sensitivities. There are areas such as offices, areas with access to the reactor, areas with radiopharmaceutical production, and fuel fabrication. Trustworthiness, depending on the need of the access of the areas, should be graded.
- 3 levels of access would be: General Area Access, Sensitive Area Access, and Protected Area Access.

26

Activity 3: Comment on **Trustworthiness** and Information Security

- General Area Access – Would include a simple background check, identity check, and reference check.
- Sensitive Area Access – Psychological tests, criminal record check, financial situation check, consultation with police/authorities.
- Protected Area Access – National security clearance which includes interviews with people who know the employee, review of travel, oversees connections, full history check for the last 10 years, and periodic reassessment.

27

Activity 3: Comment on **Trustworthiness** and Information Security

- Access is on a need-to-access basis. Only the building that you need to get into.
- Any access into the protected area by contractors or people not authorized would need to be escorted by someone with authorization.

28

Activity 3: Comment on **Trustworthiness** and Information Security

- Need-to-know principle for security related matters.
- Management of keys and locks.
- Employees found to be untrustworthy may lose clearances or their role in their respective facility.
- Security and Trustworthiness Training for employees.

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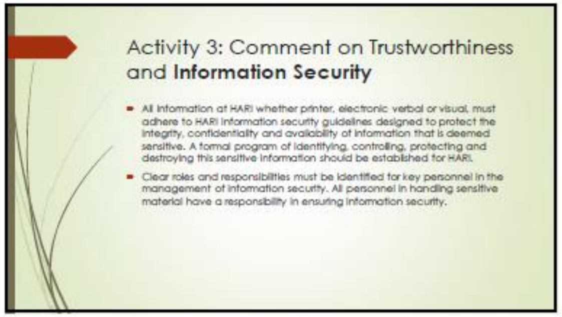
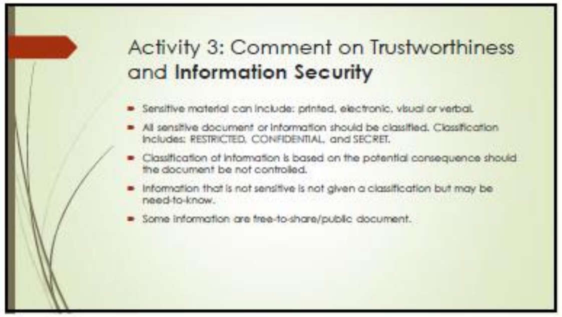
FIG. 2. HARI Site Plan

30


Activity 3: Comment on Trustworthiness and Information Security
All information at HARI whether printer, electronic verbal or visual, must adhere to HARI information security guidelines designed to protect the integrity, confidentiality and availability of information that is deemed sensitive. A formal program of identifying, controlling, protecting and destroying this sensitive information should be established for HARI.
Clear roles and responsibilities must be identified for key personnel in the management of information security. All personnel in handling sensitive material have a responsibility in ensuring information security.

31


Activity 3: Comment on Trustworthiness and Information Security
Sensitive material can include: printed, electronic, visual or verbal.
All sensitive document or information should be classified. Classification includes: RESTRICTED, CONFIDENTIAL, and SECRET.
Classification of information is based on the potential consequence should the document be not controlled.
Information that is not sensitive is not given a classification but may be need-to-know.
Some information are free-to-share/public document.

32


Activity 3: Comment on Trustworthiness and Information Security
RESTRICTED – Floor plans of the reactor, showing entrance and exit.
CONFIDENTIAL – Security system operation details.
SECRET – Security system vulnerabilities and details about the guards and response plans.
Information is marked as classified. Depending on the classification, storage requirements of the information is graded. The higher the classification, the more robust safe or electronic network is needed.
Access to classified information is always on a need-to-know and typically requires a national security clearance. This also applies to verbal information.

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Thank you!

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IAEA Regional Workshop on Managing the Interface Between Safety and Security for Research Reactors

6 – 10 June 2022

Working Group 3

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Case Study 1 – 500 kW to 3MW

- If considering the reactor change from 500 kW to 3MW there are significant safety and security implications.
- Answer to Q1 - Q3 is yes
  - consider change to the design, configuration and OLCs as a result of increased power
  - consider processes/activities that would be affected as a result of increased power, e.g. – number of people on site and period of time on site, types of experiments and reactor utilisation, frequency of handling fuel and radiological materials
  - revise DBA and security analysis considering increased source term
  - determine what safety and security regulations apply to the change – re-licensing required
  - change would involve all groups within the reactor operating organisation, including security and all expertise listed in working group outline
  - multiple changes all requiring assessment considering safety and security (reactor safety committee, security experts, regulators)

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Case Study 1 – potential impact on safety related to changes to physical protection system

- Q1 The proposed change could result in an increase in the frequency of occurrence of an accident previously evaluated in the facility safety analysis
  - Installation and maintenance of the fence posts (digging and concreting) or associated security surveillance equipment if poorly executed may damage the structures surrounding and supporting the underground building services, possibly increasing the frequency of potential disruption to power to safety systems, water supplies for reactor cooling and heating steam. Damage to heating steam line may result in damage to water and power supply
  - Assessment of the change would require facility service drawings and security design of fence and the safety analysis
  - This would require support and communication between the engineering (design and structural analysis), the safety analysis team, security/physical protection and safeguards committee and reactor safety committee to assess/address using established change control processes, including assessment of the safety category of the change and regulatory implications (which may require regulatory approval)
  - The engineering team and maintenance would need to work with the security team to ensure that the design, installation and maintenance of the fence would not compromise the building services and surrounding structure.

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Case Study 1 – potential impact on safety related to changes to physical protection system

- Q2 The proposed change could increase the risk of exposure to staff
  - The combined increase in power (consequence) and the increased frequency of potential disruption to power to safety systems, or reactor cooling could increase the risk of exposure to the facility staff
  - The additional fence barrier may impede egress of reactor staff and students during an emergency involving a radiological release. The new interior security doors will also potentially impede egress of reactor staff, increasing the exposure time.
  - Both the fence and security doors may also potentially impede the access of emergency responders to reach injured personnel.
  - Proper assessment of the increased exposure risk would require support radiation protection advisors, emergency management planning teams, the safety analysis team and reactor safety committee. The senior management team (reactor manager) would need to communicate to the concerned facility groups, including operations staff, students, radiation protection and emergency management staff.
  - Established change control processes would be followed involving discussion with the above groups, and including assessment of regulatory implications. Interactions with the regulators would be managed by regulatory affairs manager, licensing officer or reactor manager.

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Case Study 1 – potential impact on safety related to changes to physical protection system

- Q3 The proposed change could create the possibility for a malfunction of a SSC important to safety with a different result than from any previously evaluated in the facility safety analysis
  - Depending on the equipment located in the utility room and the additional physical protection (e.g. hardening of walls, installation of barriers) there could be the possibility of damaging an SSC and malfunction with a different result not previously evaluated in the safety analysis (loss of support/auxiliary systems)
  - This would require facility engineering drawings and design of the utility room and its equipment, and the safety analysis.
  - Changes to the utility room would need to be discussed with, assessed and addressed by engineering, security and safety analysis staff using established change control processes, including assessment of regulatory implications

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Case Study 2 – impact on security due to safety change

- The proposed change and activities could decrease the reliability or availability of a security system to perform its intended functions
  - The chemical tank will reduce the possibility of detection of unauthorised personnel in the protection area due to the obstructed view.
  - The delivery vehicle will further reduce defence in depth in detection
  - If the delivery time is at the same time each week, knowledge of the decreased detection availability could be exploited – work management (control and planning) needs to be considered by the operations team and security team if additional protective measures are to be applied during the delivery.
  - If the delivery vehicle is required to enter the protected area, this could introduce sabotage risk from potential collision of the truck and damage of plant, or due to driver access to the protected area who could exploit vulnerabilities identified through familiarity with the facility.

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Case Study 2 – impact on security due to safety change – continued

- The new chemical tank could also present a sabotage target, resulting in environmental and safety risk
- The security team would need to provide support on personnel security matters related to the driver(s)
- The Operations team should inform ESOs (ambulance/fire services) regarding presence of the tank for awareness of potential hazard or access issues in an emergency.
- Operations would also discuss implications with environmental groups, WHS and the security Team
- Established change control processes would be followed to address safety and security issues involving discussion with the above groups, and including assessment of regulatory implications.

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HARI – Security Management and Materials on-site

- HARI has a Nuclear Security Management System which is integrated in the organisation's IMS.
- The NSMS covers a comprehensive range of security topics comprising formal documentation, policies, procedures, practices and actions
- clearly defines the security responsibilities of HARI role holders and external support agencies (response force) and stakeholders
- change management, covers safety and security
- Safety interface
- provides facility layout and protected area features
  - materials with the potential to result in URC located in protected area

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HARI – Nuclear Security Management System

- Key elements – Appendix 10
  - Leadership for Nuclear Security – organisational structure
    - Suggest to first focus on the integrated management system and to include a subsection defining security culture and characteristics and interactions with safety culture, and how this is supported before stating the leadership focus on reward and recognition.
  - Security Operations
  - Physical Security
  - Personnel Security
  - Information Security
  - Computer Security
  - Management Processes
  - Analysis and Planning
  - Security Analysis – threat and sabotage target analysis (consequence analysis)

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HARI – NSMS - Key elements Appendix 10 continued

- Security System Design and Evaluation
- Security Plan
- Security Contingency Plan interfacing with Emergency response plan
- Access Control
- Security Training - general aspects of security culture are included here
- System sustainability
- Resource and budgeting
- Maintenance, testing and calibration
- Performance assurance
- Compensatory measures – could also refer to scalable measures associated with increased threat based on intelligence

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HARI – NSMS

- Process improvement
- Security event reporting
- Security forces, guard and off site response force
- Interfaces with the facility IMS
  - Human Resources
  - Procurement, contracts and agreements
  - Policies and directives
  - Processes and Procedures
  - Records Management and document control – suggest to include triggers for review (staff identification of errors or improvements, changes in regulatory requirements)
  - Delegation of authority
  - Management of change
  - Performance evaluation
  - Safety interface
  - Nuclear Material Accountancy and Control

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HARI – Materials on site

- Quantities and locations of nuclear and radioactive materials identified in Appendix 7 (theft targets).
- Appendix 23 Contingency Plan Section 4.4 lists the nuclear materials and also their security category
  - Suggest to also list the security category of materials in Appendix 7.
- Accounting system provides means for deterrence and detection of the unauthorised removal of radioactive and nuclear materials.
- Non-nuclear hazardous materials are not included, but an incident involving these may lead to a nuclear security or safety risk – this may be worth noting

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