



IAEA
International Atomic Energy Agency



Global Centre for Nuclear Energy Partnership

Regional Training Course on Vulnerability Analysis of Physical Protection Systems

15 - 19 September, 2014
Mumbai, India



**INTERNATIONAL ATOMIC ENERGY AGENCY
And
BHABHA ATOMIC RESEARCH CENTER &
GLOBAL CENTRE FOR NUCLEAR ENERGY PARTNERSHIP**

Report

Regional Training Course (RTC) on “Vulnerability Analysis of Physical Protection Systems”, 15 - 19 September, 2014, Mumbai, India.

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1. Introduction

School of Nuclear Security (SNSS), Global Centre for Nuclear Energy Partnership (GCNEP), Bhabha Atomic Research Center (BARC) Government of India and International Atomic Energy Agency (IAEA) jointly organized a Regional Training Course (RTC) on "Vulnerability Analysis of Physical Protection Systems" during 15 - 19 September, 2014 in Mumbai, India. This was the first RTC conducted on the important topic of vulnerability analysis of physical protection system.

The venue for the training course was Hotel Regenza by Tunga, Navi Mumbai. Prior to this, six regional training courses (RTCs) have been conducted in association with IAEA on Physical Protection of Nuclear Material and Nuclear Facilities in the year 2003, 2004, 2005, 2007, 2009 and 2011, 2013. A RTC was also organized on "Security of Radioactive Materials" in the year 2006.

The purpose of this training course was to increase the awareness of participants regarding the importance of conducting vulnerability analysis of Physical Protection System (PPS) at Nuclear Facilities to protect unauthorized removal of nuclear material and sabotage, and provide to them the information regarding the process and knowledge required to perform vulnerability analysis, as well as some examples available for that purposes. The vulnerability analysis is a systematic, performance-based process that is used to evaluate the physical protection system to meet performance requirement.

The target audience for the course includes persons who are responsible for designing and/or assessing physical protection systems. Ideally, the nominees have already participated in IAEA sponsored training courses on physical protection of nuclear material and nuclear facilities.

This Report includes the detailed overview of the course, various sessions in the training course, topics covered, list of participants and faculties, feedback obtained from the participants, some photographs of the training course and the course schedule.

2. Objective:

The objective of the training course was to provide participants with the general understanding of approaches to conduct a Vulnerability Analysis (VA) using a systematic approach to quantitatively and/or qualitatively evaluate the effectiveness of physical protection systems used to protect nuclear materials and nuclear facilities against theft and sabotage. In particular, the objectives of the course were to:

- a) Verifying that the PPS that was designed, or characterized for an existing system, satisfies the requirements
- b) Identifying any system deficiencies in the design or implementation that need to be addressed in order to meet the system requirements

c) Analysing upgrade options that may be necessary to address identified deficiencies with regard to improvement of system performance.

3. Course Details:

The entire training course was organized in 13 lecture sessions, 8 work group exercise sessions in addition to the inauguration and certificate distribution & closing session as detailed below.

3.1 Inauguration Session:

The training course was inaugurated on 15 September morning in traditional Indian style by lighting lamps by Mr. C K Pithawa, Director, Electronic & Instrumentation Group, BARC, Mr. Jang Sung Soon, Course Coordinator from IAEA, Mr. Ranajit Kumar, Head PPSS, CnID and Mr. Anand Laddha, Course Director. This was followed by address by chief guest Mr. C. K. Pithawa and other dignitaries present on the occasion.

3.2 Introduction of Participants:

The inaugural session was followed by the introduction of participants where the participants gave their introduction including their affiliating organization and country, their current position/designation, nature of work & responsibilities, and their expectation from the course.

3.3 Course Topics

The training course duration was 5 days. The course was arranged with 13 lecture sessions and 8 workgroup exercise sessions to cover wide ranging topics on planning, data collection, analysis, results and application phases of Vulnerability analysis of Physical protection system etc. were covered in this training course.

Details of the topics covered in the training course are as follow:

- 1) Course Introduction.
- 2) Overview of Vulnerability Analysis.
- 3) Planning a Vulnerability Analysis.
- 4) Data Collection: Facility Characterization.
- 5) Data Collection - Facility Visit.
- 6) Analysis Overview.
- 7) Characterize Element Performance.
- 8) Path Analysis.
- 9) Scenario Analysis.
- 10) Table-top Analysis.
- 11) Document Results of Vulnerability Analysis.
- 12) Upgrade.
- 13) Other Vulnerability Analysis Topics.

Annexure A provides the detailed schedule of the training course.

3.4 Workgroup Exercise Sessions:

Participants were divided into four groups. An exercise booklet was given to each participant describing a hypothetical facility. Participants were asked to carry out following eight work group exercises:

- 1) Exercise on Planning
- 2) Exercise on Data Collection and Facility Characterization
- 3) Exercise on Data Collection: Facility Visit Exercise
- 4) Exercise on Characterizing Element Performance
- 5) Exercise on Path Analysis
- 6) Exercise on Scenario Analysis
- 7) Exercise on Table-top Analysis
- 8) Exercise on Document Results of Vulnerability Analysis

3.5 Feedback session:

A feedback session was arranged towards the end of the training course. All the participants were asked to fill the feedback forms to give their experience about different aspects of the course. Major observations of the feedback received are:

- a) The training course is very much relevant with respect to the present work of the participants.
- b) The overall impression of the participants about the training course is very good.
- c) The training course should be completely residential for all participants.
- d) The duration of the training course should be extended to two weeks, particularly in view of the large number of topics covered.
- e) Duration of work group exercises needs to be adjusted. Some exercise took lot of time and some took less time. Also guidance for exercise during lectures will be helpful.
- f) Most of the participant asked for need to add basic PPS topics at the beginning of this course.
- g) Also participants felt visit to actual facility would have been useful.

3.6 Certification Distribution & Concluding Session

The training course successfully came to an end on 19th September afternoon after a feedback session from the participants. Certificates were distributed to all participants by Chief Guest Mr. Y. S. Mayya, Associate Director, Electronics & Instrumentation Group, BARC. Chief guest , Mr Sung Soon Jang , IAEA course coordinator, Mr, Ranajit Kumar, Head PPSS, CnID, Mr. Anand Laddha, Course Director addressed the participants in the closing function.

4. Training Course Material:

One volumes of Course Material, containing more than 300 pages of the handouts of the presentations as well as the detailed lecture notes and one volume of exercise book containing hypothetical nuclear power plant facility, exercise data etc were also provided to all the participants.

A DVD containing all the presentations, ,design & evaluation software, few important documents published by IAEA on Nuclear Security and related topics, details of participants and faculty members, some course photographs etc. were also distributed to all the course participants and faculties.

5. Training Course Participants

A total of 22 participants took part in the training course. There were 09 foreign participants – 1 from China, 3 from Indonesia, 3 from Jordan, 1 from Thailand, 1 from United Arab Emirates. The training course was attended by 13 Indian participants - 2 from NPCIL, 1 each from HWB, IGCAR, AERB, NFC, DAE and 6 from BARC including outstation units of BARC. **Annexure – B & C** gives the list of foreign participants and Indian participants respectively.

6. Faculties

A total of 05 faculty members were involved for deliberation of different lectures and conducting the work group exercises. There were 3 foreign faculty members: 1 from IAEA, 1 from USA and 1 from Russia. 02 faculty members from India took part in this training course. Also there were 3 sub-group instructors from India. The list of the faculty members, sub-group instructors both from India and abroad are attached **Annexure - D**.

7. Conclusion

Participant's feedback suggests that the training course was well organized and overall the program was very valuable. Most participants also feel that the lesson learnt in the training course will be very useful for them. The lectures were very useful in understanding the subject. Printed presentation material, lecture notes and other technical documents provided were well appreciated by everyone and they found it very informative. Based on the feedback of participants, it is recommended that future such programs should be fully residential, of longer duration and should include a facility visit.

(Anand Laddha)
Course Director

Annexure- A: Course Schedule

Schedule of the IAEA Regional Training Course (RTC) on Vulnerability Analysis of Physical Protection System Mumbai, India, 15-19 September 2014

Date	Time	Module number	Module title	Lecturer
Monday	9:00 – 9:30		Registration of participants	
15 September	9:30 – 10:00		Welcome and Inauguration of the course	
	10:00 – 10:30		Coffee break	
	10:30 – 11:00		Introduction of Participants, Courses	
	11:00 – 11:15	1	Course Introduction	Ranajit
	11:15 – 12:00	2	Overview of Vulnerability Analysis	Janice
	12:00 – 13:00	3	Planning a Vulnerability Analysis Introduction to the Lagassi Nuclear Research Institute	Sung Soon
	13:00 – 14:00		Lunch break	
	14:00 – 14:45		Exercise on Planning	
	14:45 – 15:30	4	Data Collection: Facility Characterization	Alexander
	15:30 – 15:45		Coffee break	
	15:45 – 17:45		Exercise on Data Collection and Facility Characterization	

Date	Time	Module number	Module title	Lecturer
Tuesday	9:00 – 9:15		Review of Previous day	
16 September	9:15 – 10:00	5	Data Collection - Facility Visit	Anand
	10:00 – 10:45		Exercise on Data Collection: Facility Visit Exercise 1	
	10:45 – 11:00		Coffee break	
	11:00 – 12:30		Exercise on Data Collection: Facility Visit Exercise 2	
	12:30 – 13:30		Lunch break	
	13:30 – 14:15	6	Analysis Overview	Ranajit
	14:15 – 15:45	7	Characterize Element Performance	Alexander
	15:45 – 16:00		Coffee break	
	16:00 – 17:00		Exercise on Characterizing Element Performance	

Date	Time	Module number	Module title	Lecturer
Wednesday	9:00 – 9:15		Review of Previous day	
17 September	9:15 – 10:45		Exercise on Characterizing Element Performance	
	10:45 – 11:00		Coffee break	
	11:00 – 12:30	8	Path Analysis	Janice
	12:30 – 13:30		Lunch break	
	13:30 – 16:00		Exercise on Path Analysis	
	16:00 - 16:15		Coffee break	
	16:15 – 17:15	9	Scenario Analysis	Anand

Date	Time	Module number	Module title	Lecturer
Thursday	9:00 – 9:15		Review of Previous day	
18 September	9:15 – 10:45		Exercise on Scenario Analysis	
	10:45 – 11:00		Coffee break	
	11:00 – 12:00		Exercise on Scenario Analysis	
	12:00 – 13:00		Lunch break	
	13:00 – 13:45	10	Table-top Analysis	Sung Soon
	13:45 – 15:15		Exercise on Table-top Analysis	
	15:15 – 15:30		Coffee break	
	15:30 – 17:30		Exercise on Table-top Analysis	

Date	Time	Module number	Module title	Lecturer
Friday	9:00 – 9:15		Review of Previous day	
19 September	9:15 – 10:15		Exercise on Table-top Analysis	
	10:15 – 10:45	11	Document Results of Vulnerability Analysis	Janice
	10:45 – 11:00		Coffee break	
	11:00 – 12:30		Exercise on Document Results of Vulnerability Analysis	
	12:30 – 13:30		Lunch break	
	13:30 – 14:00	12	Upgrade	Anand
	14:00 – 14:30	13	Other Vulnerability Analysis Topics	Alexander
	14:30 – 15:00		Evaluation/Feedback questions	
	15:00 – 16:00		Certificate distribution and closing ceremony	

Annexure – B: Foreign Participants

Sr. No.	Name	Organization & Country
1.	Mr. Liu Yue Jin	Fujian Fuqing Nuclear Power Co Ltd, CHINA
2.	Mr. Slamet Rubianto	National Nuclear Energy Agency Center for Nuclear Fuel Technology, INDONESIA
3.	Mr. Suwadi	Center for the Application of Isotopes and Radiation National Nuclear Energy Agency, INDONESIA
4.	Ms. Ginting Rosmeri	Burea for Legal, Public Relation and Cooperation National Nuclear Energy Agency of Indonesia (BATAN), INDONESIA
5.	Mr. Saraireh Harbi	National Center for Security and Crisis Management AMMAN, JORDAN
6.	Mr. Alrafai'ah Amin	General Directorate of Gendarmerie AMMAN, JORDAN
7.	Mr. Ababneh Abdalla	Jordan Armed Forces Directorate of Joint Chiefs of Staff Tabarbour AMMAN, JORDAN
8.	Mr. Pingish Pingish	Office of Atoms for Peace (OAP); Ministry of Science and Technology (MOST), THAILAND
9.	Ms. Alsaadi Sara	Federal Authority for Nuclear Regulation (FANR), UNITED ARAB EMIRATES

Annexure –C: Indian Participants

S.No.	Name	Organization
1.	Mr. B Jaychandran Additional Chief Engineer	NPCIL, Mumbai
2.	Mr. Manoj Prakash Additional Chief Engineer	NPCIL, Mumbai.
3.	Mr. Praveen Mohan Scientific Officer (D)	NFC, Hyderabad
4.	Mrs. Sonal Gandhi Scientific Officer (E)	AERB, Mumbai
5.	Mr. Rajesh Kumar Mishra Scientific Officer (G)	DAE, Mumbai
6.	Mr. Prabhakara Rao Scientific Officer (G)	IGCAR, Kalpakkam
7.	Mr. Kamraj Thangappa Scientific Officer(F)	HWB, Mumbai
8.	Mr. Joydipta Banerjee Scientific Officer(G)	BARC
9.	Mr. Kotikanyadanam R S Raghavan Scientific Officer(G)	BARC
10.	Mr. Uday Kulkarni Scientific Officer(G)	BARC
11.	Mr. Ritesh Bansal Scientific Officer(E)	BARC
12.	Mr. Raghunath Acharya Scientific Officer(G)	BARC
13.	Mr. Anant S Vajarekar Scientific Officer(H)	BARC

ANNEXURE - D: Faculty Members & Sub-group Instructors

Faculty

S.No.	Name	Organization & Country
1.	Mrs. Janice Jay Leach	Sandia National Laboratories, USA
2.	Mr. Alexander Vladimir Izmaylov	Eleron, RUSSIA
3.	Mr. Sung Soon Jang	IAEA (International Atomic Energy Agency), AUSTRIA
4.	Mr. Anand Laddha	BARC, INDIA
5.	Mr. Ranajit Kumar	BARC, INDIA

Sub-group Instructor

S.No.	Name	Organization & Country
1.	Mrs. Ranjana Kulgod	BARC, INDIA
2.	Mr. A. K. Sharma	BARC, INDIA
3.	Mr. Anil Upreti.	BARC, INDIA
4.	Mr. Ansul Kumar	BARC, INDIA

ANNEXURE – E: Photographs



Course Inauguration



Inaugural Speech by Mr. C K Pithawa, Director, E & I Group, BARC



Participants attending course in Lecture hall



Lecture by Mrs. Janice Leach, USA



Sub-Group exercise in Progress



Group photo