



Coordinated Research Project - Strengthening Research Reactor Security

Synopsis

An IAEA Coordinated Research Project (CRP) has been initiated to strengthen research reactor security. The first IAEA research programme for Nuclear Security of the Research Reactor and Associate Facilities (RRAFs), includes 5 topical activities. Proposals for these topics were developed after discussion among experts in the related fields.

AUTHORS:

David Ek
Sandia National Laboratories

Heather Pennington
Sandia National Laboratories

Mark Ekman
Sandia National Laboratories

Eric Ryan
Australia

Michael Clarke
IAEA

Activity 1

Review the assessment methodologies for regulated facilities (simple and complex) developed by the NUSAM CRP in relation to RRAFs.

For this activity, research will be used to determine which methodology to apply (simple, complex or both) for RRAFs, ensuring alignment between the NUSAM and RRAF CRPs and to develop “case study/ies” for RRAFs.

The output will be used to inform research reactor operators of the optimum approach needed to apply the NUSAM methodology and will provide guidance, acquired through experience with the tool, to the research reactor community.

Activity 2

Identify factors for developing a comprehensive normalised ranking scheme for security risk posed by nuclear and radioactive materials while considering the unique characteristics of RRAFs.

The resulting normalization methodology should consider the complexity and diversity of RRAFs (keeping in mind safety needs) while addressing sabotage of the reactor and reactor processes that could lead to unacceptable radiological consequences as well as theft of both radioactive and nuclear materials. These complexities include the relative attractiveness of the materials for theft (ease of handling and removal) and the attractiveness of the processes for sabotage.

The main goal of the research project is to attempt to provide a tool that allows decision makers to make risk-informed decisions about where and how to apply limited resources across multiple facilities to reduce risks by:

- developing a means to effectively compare the consequences (normalized) for theft of nuclear and/or other radioactive materials and for sabotage of RRAFs;
- defining facility and material characteristics that contribute to the attractiveness of the facility/material to an adversary intending to carry out a malicious act;
- quantifying contributing characteristics that influence the likelihood of an adversary attempting a malicious act; and
- developing an approach to combine the normalized consequence measures and the likelihood of the adversary’s attempt based on attractiveness

Activity 3

Identify and assess open-source data to develop a general threat basis statement for RRAFs.

Using open-source data, this research project will develop a general threat basis statement designed to facilitate IAEA Member States with development of their own specific threat statements.

Open-source data (news publications, internet, etc.) on major criminal and terrorist events (whether planned and executed or just planned) will be identified and analysed to adequately describe international adversary characteristics such as numbers, equipment, and capabilities. The next step is to develop an international threat statement based upon the international open-source threat data. The open-source threat criteria can be used as:

- an example that Member States could follow in developing their own threat statements;
- defacto criteria for international assistance missions and training courses in the absence of other country-specific threat criteria; and
- an initial baseline threat criteria upon which States can build their national threat statements using classified data.

Activity 4

Identify and assess available computer-based analytical tools and their technical suitability to evaluate dispersal consequences due to the introduction of external energy to be used by non-security experts.

This goal of this project will be to identify and/or develop tools to evaluate sabotage scenarios at RRAFs that include introduced energy.

Research will identify and modify (if able) existing tools that can estimate the explosive dispersal of radioactive materials. Once identified, the reliability of the tools in accurately predicting consequences, the ease of employing the tools by non-security experts, and the modifications required to make the tool an effective resource for the research reactor community will be assessed.

The output of the research will be a capability by which RRAFs may better estimate the consequences of sabotage.

Activity 5

Identify and assess available databases for evaluating the performance effectiveness of nuclear security of RRAFs.

The goal of this research project is to provide tools to assist non-security experts in the performance of effectiveness evaluations of nuclear security system(s) at RRAFs (e.g., vulnerability analysis of detection and protection devices, equipment, systems, structures, and components).

To accomplish this, the project will identify available performance data that would be useful to estimate nuclear security effectiveness for the typical security components in use at RRAFs. This information will be organized into a database format geared toward assisting non-security experts. Simple procedures for the use of these components will also be developed and included.

The output of this research project will be a simple tool that provides effectiveness estimates for security components for the purpose of enabling RRAFs to conduct self-assessments of security system effectiveness.

Summary

The IAEA CRP for RRAFs will provide assistance to both security managers and managers at RRAFs that will further their understanding of and improve the quality of facility nuclear security systems.