Document Preparation Profile (DPP)
Draft June 2019

1 IDENTIFICATION

Document Category:	**Nuclear Security Series – Technical Guidance**
Working ID:	**NST029**
Proposed Title:	**Evaluation of Physical Protection Systems at Nuclear Facilities**
Proposed Action:	**New document**
Review Committee(s) or Group:	**Nuclear Security Guidance Committee (NSGC)**
Technical Officer(s):	**Shigeaki SATO and Douglas SHULL**

2 BACKGROUND

A system for protection against unauthorized removal of nuclear material and against the sabotage of nuclear facilities is comprised of a range of nuclear security measures involving personnel, procedures and equipment. In order to ensure that a nuclear facility physical protection system is effective, it must be evaluated and tested.

The original DPP *Evaluation of Physical Protection Systems Using Performance Testing* was presented to the NSGC from 10-14 December 2012. However, following approval, drafting was postponed until the completion of the Coordinated Research Project (CRP) J02004, *Development of Nuclear Security Assessment Methodologies (NUSAM) for Regulated Facilities.* This postponement will allow the drafters to draw upon the assessment methodologies developed in the CRP. The results of the CRP as well as other Nuclear Security Series (NSS) guidance published since the original DPP has identified a need to broaden the scope of this publication to include more technical guidance on methods of performance testing and methods to evaluate the system effectiveness of the physical protection system. The expanded scope is reflected in the revised DPP as well as the revised title: *Evaluation of Physical Protection Systems at Nuclear Facilities.*

Member States have requested additional detailed guidance on the process and methods to perform the physical protection system evaluations including performance testing. This guidance will elaborate on the recommendations set out in the *Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities, International Atomic Energy Agency Information Circular (INFCIRC/225/Revision 5)* (NSS 13) as well as guidance provided in *Physical Protection of Nuclear Material and Nuclear Facilities (Implementation of INFCIRC/225/Revision 5)* (NSS 27-G) and *Use of Nuclear Material Accounting and Control for Nuclear Security Purposes at Facilities* (NSS 25-G). The publication will also refer to other related NSS publications: *Handbook on Design of Physical Protection Systems for Nuclear Material and Nuclear Facilities* (NST055, in preparation) and *Regulatory Authorization for Nuclear Security during the Lifetime Stages of Nuclear Facilities* (NST060, in preparation). Furthermore, this new guidance will also draw on the recently published IAEA-TECDOC-1868, Nuclear Security Assessment Methodologies for Regulated Facilities.

3 JUSTIFICATION

NSS 13 and NSS 27-G provide general nuclear security guidance for evaluations and NST055 will provide general guidance for Phase 3 evaluation of the physical protection system. However, there is currently no detailed technical guidance on the process and methods to perform the physical protection system evaluations or performance testing. This Technical Guidance will provide Member States with methods for performance testing and for evaluating the effectiveness of physical protection systems to ensure that they are effective in protecting nuclear material in use and storage against unauthorized removal or protecting nuclear material or facilities against sabotage.

4 OBJECTIVE

The objective of this Technical Guidance is to provide operators, competent authorities, and physical protection system designers with methods to (1) test and evaluate components and subsystems for each of the three functions (detection, delay, and response) of the physical protection system, including its hardware/ equipment, software, people and procedures; and (2) evaluate the overall effectiveness of the physical protection system. Using a graded approach, this Technical Guidance will provide general processes for the establishment of a minimum set of physical protection system evaluation methods, including performance testing requirements. The Technical Guidance will address roles and responsibilities, methods that may be required or recommended by a competent authority, documentation and the frequency of evaluation and testing. The Technical Guidance will also address prescriptive, performance-based, and combined approaches for the evaluation of a physical protection system.

5 SCOPE

This Technical Guidance will describe methods of evaluating the effectiveness of a physical protection system and limited and full scope performance testing approaches. It will also address the evaluation of measures to prevent and to protect against attempted unauthorized removal of nuclear material or sabotage of nuclear material or nuclear facilities and to respond to such attempts in order to prevent their successful completion. Methods for evaluating nuclear material accounting and control (NMAC) systems will also be included in the scope of the publication. This Technical Guidance will not address the evaluation of computer security for the protection of nuclear facilities since it is addressed in detail in other publications. Although some aspects of blended attacks will be addressed in the context of evaluation of physical protection system.

6 PLACE IN THE OVERALL STRUCTURE OF THE RELEVANT SERIES AND INTERFACES WITH EXISTING AND/OR PLANNED PUBLICATIONS

The publication will be a Technical Guidance in the Nuclear Security Series (NSS). This new Technical Guidance will support implementation of NSS 13 and NSS 27-G.

The new Technical Guidance is expected to interface with other NSS publications including: NSS 20, NSS 8, NSS 25-G, NSS 26-G, NSS 10, NSS 32-T, and NSS 35-G.

The new Technical Guidance will supplement the guidance provided in other Technical Guidance publications including NST055, NST060, and IAEA-TECDOC-1868.

7 OVERVIEW

The suggested outline content of the proposed Technical Guidance is as follows:

1. Introduction
- 1.1. Background
- 1.2. Objective
- 1.3. Scope
- 1.4. Structure

2. Overview of the Physical Protection System Evaluation
- 2.1. Methodologies for physical protection evaluations
- 2.2. Risk assessment
- 2.3. Regulatory approaches (prescriptive, performance-based)
- 2.4. Performance testing metrics
- 2.5. Elements of performance characterization

3. Process of the Physical Protection System Evaluation
- 3.1. Assessment to verify that the physical protection system meets requirements
  - 3.1.1. Prescriptive approach
    - 3.1.1.1. Organization, operational plans and procedures
    - 3.1.1.2. Records, logs and personnel training
    - 3.1.1.3. Interviews including knowledge testing
    - 3.1.1.4. Matching procedures
    - 3.1.1.5. Review of specific features
    - 3.1.1.6. Evaluation of physical protection system requirements
    - 3.1.1.7. Information gathering
  - 3.1.2. Performance approach
    - 3.1.2.1. Existing facilities – conduct performance tests
    - 3.1.2.2. Facilities being designed – conduct simulations
    - 3.1.2.3. Existing facilities – conduct simulations
    - 3.1.2.4. Direct comparative reviews of other test data
  - 3.1.3. Combined approach
  - 3.1.4. Identifying deficiencies
  - 3.1.5. Corrective actions
  - 3.1.6. Identification of protection measure efficiencies
  - 3.1.7. Evaluating design options
  - 3.1.8. Blended attacks
- 3.2. Performance testing
  - 3.2.1. Performance requirements
    - 3.2.1.1. Technical criterion
    - 3.2.1.2. Specifications
  - 3.2.2. Selection of physical protection measures to test
    - 3.2.2.1. Facility operation
    - 3.2.2.2. Testing schedules
    - 3.2.2.3. Regulatory requirement
    - 3.2.2.4. Lessons learned/operational experience
    - 3.2.2.5. Previous results
    - 3.2.2.6. Security events
    - 3.2.2.7. Other information

3.2.3. Limited scope testing
3.2.3.1. Tests of individual physical protection measures
3.2.3.2. Test of combination of physical protection measures
3.2.4. Performance indicators
3.2.4.1. Detection probabilities
3.2.4.2. Delay times
3.2.4.3. Response times
3.2.4.4. Other
3.2.5. Determination of defeat methods including blended attacks
3.2.6. Other considerations
3.2.6.1. Plan development
3.2.6.2. Frequency of tests
3.2.6.3. Test criteria
3.2.6.4. Test integration with other organizations
3.2.6.5. Documenting results
3.2.6.6. Reporting deficiencies
3.2.6.7. Corrective actions
3.2.6.8. Sharing lessons learned and good practices
3.2.6.9. Test data integration
3.2.7. Full scope performance testing
3.2.7.1. Benefits
3.2.7.2. Drawbacks
3.2.7.3. Planning and coordination
3.2.7.4. Establishing clear objectives
3.2.7.5. Attack scenario selection
3.2.7.6. Use of tabletop exercises
3.2.7.7. Use of simulations
3.2.7.8. Adversaries and capabilities
3.2.7.9. Compensatory measures
3.2.7.10. Safety aspects and controls
3.2.7.11. Communications
3.2.7.12. Test methodologies
3.3. Analysis methods
3.3.1. Path analysis
3.3.1.1. Analysis of potential paths
3.3.1.2. Critical paths
3.3.1.3. Probability to interruption
3.3.2. Neutralization analysis
3.3.2.1. Response
3.3.2.2. Threat
3.3.2.3. Physical protection system
3.3.2.4. Methodologies (simple to complex)
3.3.2.5. Engagement modelling
3.3.2.6. Performance based
3.3.2.7. Assumptions

3.3.2.8. Documenting neutralization value
3.3.3. Determining probability of effectiveness
3.3.3.1. Methodologies
3.3.4. Insider analysis
3.3.4.1. Insider types
3.3.4.2. Capabilities
3.3.4.3. Expert review
3.3.4.4. Path analysis
3.3.4.5. Tabletop exercises
3.3.5. NMAC
3.3.5.1. Records
3.3.5.2. Accounting
3.3.5.3. Measurements
3.3.5.4. NM controls
3.3.5.5. NM movements
3.3.6. Scenario analysis

4. Implementation of Performance Testing (Including Exercises)
4.1. Program development
4.1.1. Coordination with other organizations
4.1.2. Integration with other organizations
4.1.3. Planning
4.1.3.1. Criteria for frequency of testing
4.1.3.2. Minimize facility disruption
4.1.3.3. Briefing and meetings
4.1.3.4. Safety aspects
4.1.3.5. Design of tests
4.1.3.6. Developing test plans
4.1.3.7. Statistical confidence
4.1.3.8. Personnel qualifications
4.1.3.9. Independent testing
4.1.3.10. Interpreting and applying test data
4.1.3.11. Validation
4.1.3.12. Feedback and improvement
4.1.4. Conduct
4.1.5. Data management plan
4.1.5.1. Data integration with other testing
4.1.5.2. Data collection
4.1.5.3. Analysis and maintenance of data
4.1.6. Periodic equipment and software testing
4.1.6.1. Acceptance testing
4.1.6.2. Sustainability testing
4.1.7. Performance testing types
4.1.7.1. Limited scope
4.1.7.2. Full scope

PRODUCTION SCHEDULE (To be revised by IAEA)

Provisional schedule for preparation of the publication, outlining realistic expected dates for:

STEP 1: Preparing a DPP	Complete
STEP 2: Approval of DPP by the Coordination Committee	September 2018
STEP 3: Approval of DPP by NSGC	July 2019
STEP 4: Approval of DPP by the Commission for Safety Standards (CSS)	N/A
STEP 5: Preparing and completing the draft	2019
STEP 6: Approval of draft by the Coordination Committee	Q 1 2020
STEP 7: Approval by NSGC for submission to Member States for comments	June 2020
STEP 8: Soliciting comments by Member States	July 2020
STEP 9: Addressing comments by Member States	January 2021
STEP 10: Approval of the revised draft by the Coordination Committee Review in Office of Coordination for Nuclear Safety and Security (NSOC)	April 2021
STEP 11: Approval by NSGC	June 2021
STEP 12: Approval by Deputy Director General (DDG)-NS	August 2021
STEP 13: Establishment by the Publications Committee	October 2021
STEP 14: Target publication date	December 2022

8 RESOURCES

It is estimated that development of the Technical Guidance will involve approximately 32 weeks of effort by Member States experts. This is based upon assuming 2 one-week expert meetings involving an average of 8 experts and an average of 2 weeks of work per expert between meetings. Secretariat resources involved are estimated at 8 weeks of effort by Agency staff plus support for expert travel and honoraria for experts whose effort is not otherwise funded. A Technical Meeting should be conducted at the beginning of the development of the document to identify as many good practices in this area as possible.