



OFFICIAL

ONR GUIDE			
CATEGORISATION FOR THEFT			
Document Type:	Nuclear Security Technical Assessment Guide		
Unique Document ID and Revision No:	CNS-TAST-GD-6.1 Revision 0		
Date Issued:	March 2017	Review Date:	March 2020
Approved by:	David Pascoe	Professional Lead	
Record Reference:	TRIM Folder 4.4.2.19076. (2017/106074)		
Revision commentary:	New document issued		

TABLE OF CONTENTS

1. INTRODUCTION	2
2. PURPOSE AND SCOPE	2
3. RELATIONSHIP TO RELEVANT	2
4. RELATIONSHIP TO IAEA DOCUMENTATION AND GUIDANCE	2
5. RELATIONSHIP TO NATIONAL POLICY DOCUMENTS	3
6. ADVICE TO INSPECTORS	4
7. TARGET IDENTIFICATION FOR THEFT.....	4
8. CONSIDERATIONS IN SETTING GRADED PROTECTION REQUIREMENTS BASED ON MATERIAL FORM.....	4
9. ADDITIONAL CONSIDERATIONS BASED ON AGGREGATION OF NUCLEAR MATERIAL.....	6
10. CATEGORISATION OF RADIOACTIVE SOURCES.....	7
13. GLOSSARY AND ABBREVIATIONS	10

OFFICIAL

OFFICIAL**1. INTRODUCTION**

- 1.1 The Office for Nuclear Regulation (ONR) has established a set of Security Assessment Principles (SyAPs) (Reference 7). This document contains Fundamental Security Principles (FSyPs) that dutyholders must demonstrate have been fully taken into account in developing their security arrangements to meet relevant legal obligations. The security regime for meeting these principles is described in security plans prepared by the dutyholders, which are approved by ONR under the Nuclear Industries Security Regulations (NISR) 2003 (Reference 1).
- 1.2 The term 'security plan' is used to cover all dutyholder submissions such as nuclear site security plans, temporary security plans and transport security statements. NISR Regulation 22 dutyholders may also use the SyAPs as the basis for Cyber Security and Information Assurance (CS&IA) documentation that helps them demonstrate ongoing legal compliance for the protection of Sensitive Nuclear Information (SNI). The SyAPs are supported by a suite of guides to assist ONR inspectors in their assessment and inspection work, and in making regulatory judgements and decisions. This Technical Assessment Guidance (TAG) is such a guide.

2. PURPOSE AND SCOPE

- 2.1 This TAG contains guidance to advise and inform ONR inspectors in exercising their regulatory judgment during assessment activities relating to a dutyholder's processes to identify theft targets through the categorisation of its inventory of Nuclear Material and Other Radioactive Material (NM/ORM). It aims to provide general advice and guidance to ONR inspectors on how this aspect of security should be assessed. It does not set out how ONR regulates the dutyholder's arrangements. It does not prescribe the methodologies for dutyholders to follow in demonstrating they have addressed the SyAPs. It is the dutyholder's responsibility to determine and describe this detail and for ONR to assess whether the arrangements are adequate.

3. RELATIONSHIP TO RELEVANT LEGISLATION

- 3.1 The term 'dutyholder' mentioned throughout this guide is used to define 'responsible persons' on civil nuclear licensed sites and other nuclear premises subject to security regulation, a 'developer' carrying out work on a nuclear construction site and approved carriers, as defined in NISR. It is also used to refer to those holding SNI.
- 3.2 NISR defines a 'nuclear premises' and requires 'the responsible person' as defined to have an approved security plan in accordance with Regulation 4. It further defines approved carriers and requires them to have an approved Transport Security Statement in accordance with Regulation 16. Persons to whom Regulation 22 applies are required to protect SNI. ONR considers Physical Protection Systems (PPS) to be an important component of a dutyholder's arrangements in demonstrating compliance with relevant legislation.

4. RELATIONSHIP TO IAEA DOCUMENTATION AND GUIDANCE

- 4.1 The essential elements of a national nuclear security regime are set out in the Convention on the Physical Protection of Nuclear Material (CPPNM) (Reference 4) and the IAEA Nuclear Security Fundamentals (Reference 3). Further guidance is available within IAEA Technical Guidance and Implementing Guides.

OFFICIAL

OFFICIAL

4.2 Fundamental Principle H of the CPPNM refers to the graded approach and states that physical protection requirements should be based on a graded approach, taking into account the current evaluation of the threat, the relative attractiveness, the nature of the material and potential consequences associated with the unauthorised removal of material and with the sabotage against nuclear material or nuclear facilities. The importance of issues relating to the graded approach is also recognised in the Nuclear Security Fundamentals, specifically:

- Essential Element 9: Use of Risk Informed Approaches – 3.9 A nuclear security regime uses risk informed approaches, including the allocation of resources for nuclear security systems and nuclear security measures and in the conduct of nuclear security related activities that are based on a graded approach and defence in depth, which take into consideration:
 - a) The State's current assessment of the nuclear security threats, both internal and external;
 - b) The relative attractiveness and vulnerability of identified targets to nuclear security threats;
 - c) Characteristics of the nuclear material, other radioactive material, associated facilities and associated activities;
 - d) Potential harmful consequences from criminal or intentional unauthorized acts involving or directed at nuclear material, other radioactive material, associated facilities, associated activities, sensitive information or sensitive information assets, and other acts determined by the State to have an adverse impact on nuclear security.

4.3 A more detailed description of the graded approach is provided in Recommendations level guidance, specifically Nuclear Security Series (NSS) 13, Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5) (Reference 2). This document states that a graded approach is used to provide higher levels of protection against events that could result in higher consequences. For protection against unauthorised removal, the State should regulate the categorisation of NM in order to ensure an appropriate relationship between the NM of concern and the physical protection measures.

5. RELATIONSHIP TO NATIONAL POLICY DOCUMENTS

5.1 The SyAPs provide ONR inspectors with a framework for making consistent regulatory judgements on the effectiveness of a dutyholder's security arrangements. This TAG provides guidance to ONR inspectors when assessing a dutyholder's submission demonstrating they have effective processes in place to achieve SyDP 6.1 – Categorisation for Theft, in support of FSyP 6 – Physical Protection Systems. The TAG is consistent with other TAGs and associated guidance and policy documentation.

5.2 The HMG Security Policy Framework (SPF) (Reference 5) describes the Cabinet Secretary's expectations of how HMG organisations and third parties handling HMG information and other assets will apply protective security to ensure HMG can function effectively, efficiently and securely. The security outcomes and requirements detailed in the SPF have been incorporated within the SyAPs. This ensures that dutyholders are presented with a coherent set of expectations for the protection of nuclear premises, SNI

OFFICIAL

OFFICIAL

and the employment of appropriate personnel security controls both on and off nuclear premises.

- 5.3 The Classification Policy (Reference 6) indicates those categories of SNI, which require protection and the level of security classification to be applied.

6. **ADVICE TO INSPECTORS**

- 6.1 Physical protection requirements should be based on a graded approach, taking into account the current evaluation of the threat, the relative attractiveness, the nature of the nuclear material and potential consequences associated with the unauthorised removal of nuclear material. The tables in Annex A to the SyAPs show the allocation to categories of materials in the various forms and quantities held or used. Materials are to be allocated to the appropriate categories and given the degree of security as set out in associated guidance. Other factors such as dilution and aggregation should be taken into account when appropriate.

In cases where dutyholder submissions are challengingly technical and complex, inspectors should seek advice from the ONR Security Informed Nuclear Safety (SINS) team.

Regulatory Expectation

- 6.2 The regulatory expectation placed on the dutyholder is that they should demonstrate within their security plan how site or facility categorisation for theft has been implemented according to the quantities and forms of all NM and ORM held or used. They should also demonstrate how they identify and manage potential planned or unplanned changes to inventory and/or operations at a site/facility that might affect its categorisation, in order to ensure an appropriate PPS and the associated outcomes are maintained at all times.

FSyP 6 - Physical Protection Systems	Categorisation for Theft	SyDP 6.1
Dutyholders should undertake a characterisation of their site and facilities in order to determine the categorisation for theft.		

7. **CATEGORISATION FOR THEFT**

- 7.1 Table 1 (with notes) of Annex A to SyAPs details the categorisation of NM in any form except Intermediate and Low Level Waste containing NM, which is covered by Table 2 (with notes).
- 7.2 Table 1 reflects the tables in the extant versions of INFCIRC/225, the Nuclear Suppliers Group Guidelines and the CPPNM and reflects the contents of the Guidelines for the Management of Plutonium. However, Tables 1 and 2 are not identical with these international tables/documents and should not be referenced outside the UK.

8. **CONSIDERATIONS IN SETTING GRADED PROTECTION REQUIREMENTS BASED ON MATERIAL FORM**

OFFICIAL

OFFICIAL

- 8.1 A three-factor methodology is initially used to categorise un-irradiated NM in order to determine the appropriate physical protection against theft. With this methodology, for any NM, the element, the isotopic composition, and the quantity, are the three factors considered to initially determine the level of physical protection required to protect against theft. This methodology is simple, but there are situations when it may result in overly conservative protection requirements for the material being protected and the form of the material also needs to be considered. Therefore, the dutyholder may consider other attributes of the material which might provide additional impediments to an adversary in potential theft scenarios, such as dilution or extensive material separation issues.
- 8.2 The IAEA recommendations recognise the need for consideration of other factors:
- For NM in general, “the categorisation is the basis for a graded approach for protection against unauthorised removal of nuclear material that could be used in a nuclear explosive device, which itself depends upon: the type of NM (e.g. Pu and U), isotopic composition (i.e. content of fissile isotopes), physical and chemical form, degree of dilution, radiation level, and quantity.”
 - For waste, “Nuclear material which is in a form that is no longer usable for any nuclear activity, minimises environmental dispersal and is practically irrecoverable, may be protected against unauthorised removal in accordance with prudent management practice.”
 - For irradiated fuel, the IAEA guidance allows reduction of category based on radiation level.
- 8.3 Material that is in a dilute form will force an adversary to acquire much larger volumes and masses of material to obtain a significant quantity of NM. The adversary may also be faced with greater difficulty in recovering the NM such as a need to perform extensive processing to convert the NM to a form usable in a nuclear explosive device. Given these additional challenges for the adversary, dutyholders may consider dilution in the categorisation of NM. Possible additional factors could be the concentration of NM and the homogeneity of the concentration within the material. The processing and storage of NM forms that are less attractive to an adversary may be beneficial as a control measure.
- 8.4 Material which is widely dispersed within a store, either in individual containers, or as part of a homogenous mass, will force an adversary to acquire larger volumes and masses of material to obtain a significant quantity of NM. The adversary then has greater difficulty in identifying and separating the NM from the other less attractive materials. Given these additional challenges, dutyholders may consider dispersion in the categorisation of NM for theft.
- 8.5 The chemical and physical form of the material may have a significant impact on the attractiveness for theft. For example, materials that are bound into immobile matrices, such as cementitious grout or a vitrified product, will also create difficulties for adversaries. The chemical and physical form may be considered within the theft categorisation process.
- 8.6 The location of materials may be an important factor in the theft categorisation. Different types of store and container have significantly different inherent characteristics which will impact on the attractiveness for theft. Materials stored in heavy, shielded flasks and containers which require the use of substantial equipment to open flasks or seals (for

OFFICIAL

OFFICIAL

example cranes or specialist tooling) will be inherently more secure than drummed materials. Equally, material located within shielded structures such as vaults or concrete pressure vessels, will be inherently protected by the limited physical access to such stores, and a similar need for heavy equipment or specialist tooling to obtain access to the stored inventory. The inherent features of such stores may be considered within the categorisation process by the dutyholder.

- 8.7 The dutyholder should develop a fully documented evaluation of the categorisation for theft which incorporates the basic three-factor methodology and then considers and justifies how other factors considered above may modify the overall categorisation.

9. **ADDITIONAL CONSIDERATIONS BASED ON AGGREGATION OF NUCLEAR MATERIAL**

- 9.1 Consideration may need to be given to adding together, or aggregating, the total amount of NM contained within a nuclear facility, group of buildings or group of rooms when assigning physical protection levels to prevent the theft of nuclear material. The method for adding NM together, also known as NM aggregation, is an important element in deciding (potentially increasing) the required levels of physical protection.
- 9.2 A key consideration is what an adversary could feasibly collect and remove in a single attack scenario. Consideration should also cover the possibility that quantities of NM may be removed by a single adversary from several locations or buildings (e.g. by an insider).
- 9.3 In some facilities, NM of the same type may be located in several different buildings, for different purposes or at different stages of processing. For example, there may be Category II quantities of specific material in one building and a Category II quantity of similar material in another building within the same Protected Area. Considered individually, each quantity of material is Category II. However, if all the material could be taken during a single adversary attack, the material could be designated as Category I and the PPS should be correspondingly robust.
- 9.4 NM of different types (e.g. Pu and U with different levels of enrichment) may be co-located in the same nuclear facility. The total amount of NM in the facility should be considered in determining the categorisation of the NM in any specific location, and hence in identifying the appropriate physical protection measures to apply to the NM. There are several mathematical approaches for calculating the category for aggregated quantities of different NM, and the dutyholder should decide which approach is appropriate. The ONR SINS team can provide advice on the adequacy of the methodology adopted by the dutyholder. Enhanced protection against unauthorised removal from different locations within a nuclear facility may not be required if the operator can justify that unauthorised removal of separate quantities of materials from the different locations by a single adversary is unlikely because:
- The separate locations are protected by separate PPSs, and guards and/or response forces are able to effectively counter attacks by adversaries to both locations; and
 - The separate locations are managed by and under control of different groups of employees, thereby limiting the threat from an insider to only one of the locations.

OFFICIAL

OFFICIAL

9.5 The dutyholder may also consider how much NM an adversary could acquire in a specified time period to inform the decision as to what level of physical protection is considered appropriate for an aggregated amount. The dutyholder should then justify appropriate physical protection measures to reduce an adversary's ability to aggregate NM, or apply appropriate physical protection measures if the aggregation of NM results in a higher category. Any justifications for a reduced level of protection should be verified and approved by the dutyholder and assessed by the inspector before being implemented.

10. CATEGORISATION OF RADIOACTIVE SOURCES

- 10.1 Radioactive sources are placed in security groups according to guidance issued by the IAEA. For the purposes of determining security protection these groups and categories of source are set out in Table 3 of Annex A of the SyAPs. Many of the sources referred to are typically used in medical or industrial applications, and the examples given here are intended to serve as a guide to source types and categorisation. The IAEA methodology for categorising radioactive sources, using the A/D activity ratio, is set out in IAEA Safety Guide Ref RS-G-1.9 (Reference 8).
- 10.2 The categorisation system has five categories. Within this, sources in Category 1 are considered to be the most harmful because they can pose a very high risk to human health if not managed safely and securely. An exposure of only a few minutes to an unshielded Category 1 source may be fatal. At the lower end of the categorisation system, sources in Category 5 are the least dangerous; however, even these sources should be kept under appropriate control.
- 10.3 Where a number of radioactive sources are regularly used or stored together, or are in close proximity, their aggregation should be considered. Thus, the total radioactivity of the sources should be assessed using the IAEA methodology (Reference 8) to identify the security grouping and level of security protection needed.
- 10.4 Dutyholders should also be able to demonstrate how they identify and manage potential planned or unplanned changes to operations at a site/facility that might affect its categorisation to ensure an appropriate PPS and outcomes are maintained at all times.

Inspectors should consider:

- Is the dutyholder's methodology consistent with the quantities in the categorisation tables at Annex A to the SyAPs?
- Does the dutyholder's methodology result in identification and use of the correct categorisation table (and notes) within Annex A of SyAPs?
- Is the methodology consistent with the quantities in the categorisation tables (and notes) within Annex A of SyAPs?
- Are other relevant factors such as dilution, dispersion, chemical and physical form, location and radiation appropriately incorporated in categorisation?
- Does the methodology ensure that issues relating to aggregation are adequately addressed?

OFFICIAL

OFFICIAL

- Are there processes in place to identify and manage potential planned or unplanned changes to inventory and/or operations at a site/facility that might affect its categorisation?

OFFICIAL

OFFICIAL

12. REFERENCES

1. **Nuclear Industries Security Regulations 2003**. Statutory Instrument 2003 No. 403
2. **IAEA Nuclear Security Series No. 13**. Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (**INFCIRC/225/Revision 5**). January 2011. www-pub.iaea.org/MTCD/Publications/PDF/Pub1481_web.pdf.
3. **IAEA Nuclear Security Series No. 20**. Objective and Essential Elements of a State's Nuclear Security Regime. http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1590_web.pdf
4. **Convention on the Physical Protection of Nuclear Material (CPPNM)**
<https://ola.iaea.org/ola/treaties/documents/FullText.pdf>
5. **HMG Security Policy Framework**. Cabinet Office.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/316182/Security_Policy_Framework_-_web_-_April_2014.pdf
6. **NISR 2003 Classification Policy** – Trim Ref. 2012/243357.
7. **Security Assessment Principles** – Trim Ref. 2017/121036
8. IAEA Safety Guide Ref RS-G-1.9. Categorisation of Radioactive Sources. <http://www-pub.iaea.org/books/IAEABooks/7237/Categorization-of-Radioactive-Sources>

Note: ONR staff should access the above internal ONR references via the How2 Business Management System.

OFFICIAL

OFFICIAL**13. GLOSSARY AND ABBREVIATIONS**

CPPNM	Convention on the Physical Protection of Nuclear Material
CS&IA	Cyber Security and Information Assurance
FSyP	Fundamental Security Principle
IAEA	International Atomic Energy Agency
NISR	Nuclear Industries Security Regulations
NM	Nuclear Material
NSS	Nuclear Security Series
ONR	Office for Nuclear Regulation
ORM	Other Radioactive Material
PPS	Physical Protection System
SINS	Security Informed Nuclear Safety
SNI	Sensitive Nuclear Information
SPF	Security Policy Framework
SyAP	Security Assessment Principle
SyDP	Security Delivery Principle
TAG	Technical Assessment Guide

OFFICIAL