ONR GUIDE			
GUIDANCE ON HOW TO ASSESS THE ADEQUACY OF A VITAL AREA IDENTIFICATION SUBMISSION			
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1. INTRODUCTION

1.1 The Office for Nuclear Regulation (ONR) has established its security objectives for dutyholders to meet. The security regime for meeting these objectives is described in the Nuclear Site Security Plans (NSSPs) prepared by dutyholders, which are approved by ONR. These objectives are given in the National Objectives, Requirements and Model Standards (NORMS) document, which describes how the objectives might be achieved through a set of requirements and model standards, although other security arrangements may be applied provided they meet the objectives. NORMS is 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 Guide (TAG) is such a guide.

2. PURPOSE AND SCOPE

2.1 This TAG contains guidance to advise and inform ONR Safety Inspectors and Security Inspectors in the exercise of their regulatory judgement. It aims to provide general advice and guidance to ONR staff on how the adequacy of a dutyholder's submission on Vital Area Identification (VAI) should be assessed and the arrangements for their production and management. It does not set out how ONR regulates these arrangements, or provide examples of the detailed information that these submissions should contain.

2.2 It should be noted that whilst the requirement to carry out VAI is a security requirement, due to their complexity, the technical review on engineering and nuclear safety related aspects will need to be carried out by appropriate operational and safety specialists employed by the dutyholder. In order to produce a comprehensive VAI study the dutyholder must consider all the failures and fault sequences which have the potential to give rise to an Unacceptable Radiological Consequence (URC) and how this could be realised given the threats in Nuclear Industries Malicious Capabilities Planning Assumptions (NIMCA). The dutyholder must also demonstrate that an understanding of the effects of the NIMCA threats has formed a fundamental part of the VAI study.

2.3 Appendix 1 to this guide contains details on the type of information that will need to be considered by a dutyholder and covered in a VAI submission. As the content of this Appendix is primarily concerned with technical issues associated with nuclear safety, responsibility for the content and the ownership of this Appendix rests with ONR Safety Assessors employed in the Security Informed Nuclear Safety (SINS) team.

2.4 Further information on the protection of Vital Areas (VAs) and the graded approach to sabotage is contained in Parts One and Three of the NORMS document (see paragraph 5.3). The definition of a Vital area (VA) is also given in NORMS.

2.5 As this guide will be used by both ONR Civil Nuclear Security (CNS) Inspectors and Safety inspectors employed in the Security Informed Nuclear Safety (SINS) team to consider the adequacy of a dutyholder's submission, it indicates to dutyholders and other stakeholders the standards that ONR expects. It is intended that this guide will influence the issues that should be addressed in a NSSP as detailed in a separate TAG (see CNS–TAST-GD-001, Revision 1).

2.6 Throughout a site's life cycle, the security arrangements in place, together with their rationale, are to be detailed in an approved NSSP. Where necessary, submissions for

validation relating to VAI should be submitted by dutyholders' as detailed in Part One of the NORMS document.

2.7 The guide does not prescribe the detail or the depth that needs to be addressed; these remain the responsibility of the dutyholder and will be dependent upon the specifics of each submission.

3. RELATIONSHIP TO RELEVANT LEGISLATION

3.1 The term 'dutyholder' mentioned throughout this guide is used to define 'responsible persons' on civil licensed nuclear sites and other (unlicensed) nuclear premises subject to security regulation, as defined in the Nuclear Industries Security Regulations (NISR) 2003 (References 1 and 2). It is also used to refer to a 'Licensee' as defined in paragraph 1 of a Nuclear Site Licence granted under the provisions of the Nuclear Installations Act 1965, or a 'developer' carrying out work on a nuclear construction site, as described in the Nuclear Industries Security (Amendment) Regulations 2013 (Reference 3).

3.2 The NISR 2003 (as amended) defines a 'nuclear premises' and requires 'the responsible person' as defined to have an approved security plan in accordance with Regulation 4. Within this plan issues relating to VAI are to be detailed and addressed.

4. RELATIONSHIP TO IAEA DOCUMENTATION AND GUIDANCE

4.1 International Atomic Energy Agency (IAEA) document 'Nuclear Security Recommendations on the Physical Protection of Nuclear Material and Nuclear Facilities' (INFCIRC225 Revision 5) (Reference 4) contains principles that the UK is obligated to take into account. Part 5 of this document contains recommendations on the requirements for measures to protect against the sabotage of Nuclear Material (NM) and nuclear facilities. An associated objective of the 'State's' physical protection regime in Part 5, is to ensure the implementation of rapid and comprehensive measures to mitigate or minimise the radiological consequences of sabotage, taking emergency plans into account. Also, IAEA Technical Guidance document (NSS No 16) 'Identification of Vital Areas at Nuclear Facilities' (Reference 5) includes the latest guidance on the requirements for measures against the sabotage of NM and nuclear facilities in use and storage. Where appropriate, elements of this guidance have been included in this TAG.

5. RELATIONSHIP TO NATIONAL POLICY DOCUMENTS

5.1 For the purposes of this TAG, the 'License holders' are dutyholders, the 'security plan' is the NSSP, and the 'competent authority' is ONR.

5.2 The 'threat assessment/design basis threat' is detailed in the extant version of the NIMCA document (Reference 6). This document refers to the malicious capabilities associated with sabotage that need to be addressed and the requirement for dutyholders to carry out VAI.

5.3 Parts One and Three of the NORMS document (Reference 7) deals with the requirement for dutyholders to carry out VAI, so that the potential for sabotage and associated radiological consequences can be evaluated by the ONR SINS team in conjunction with other ONR Safety Inspectors, taking into account the graded

approach to sabotage, as detailed in Part One, Chapter 1, paragraph 1.1.13 of the NORMS document.

5.4 The HMGSecurity Policy Framework (SPF) (Reference 8), issued by the Cabinet Office is adopted by the whole of the civil nuclear industry for the protection of Sensitive Nuclear Information (SNI), (which includes that associated with VAs) and the employment of appropriate personnel security controls on and off nuclear premises.

5.5 The NISR Classification Policy CWP/G8 (Reference 9) indicates those categories of SNI, including information associated with VAs, that require protection and the level of protective marking to be applied.

6. ADVICE TO INSPECTORS

6.1 All dutyholders should carry out VAI, aimed at identifying those targets that are vulnerable to sabotage that could potentially cause an unacceptable radiological consequence (URC) (see Part One, Chapter 1, Annex C of the NORMS document). This work should be carried out by suitably qualified and experienced specialist safety and operational staff with advice from the security department concerned. Where a dutyholder does not develop all aspects of the submission and uses contractors for this purpose, the dutyholder must demonstrate that a technical review has been undertaken independently of the contractor producing the submission. During the process, these specialists should also consider how a potential VA can be engineered out from a safety perspective. This could involve the provision of additional safety systems or further diversification and this is an important aspect of VAI that should be considered before a decision is made to apply physical protection.

6.2 The judgment of the ONR SINS team is required when deciding the adequacy of a dutyholder's submission relating to potential VAs. The ONR SINS team will make an assessment of the technical adequacy of each VAI submission, taking the respective parts of the NIMCA and NORMS documents into account with regard to malicious capabilities and the graded approach to sabotage. The ONR SINS team will provide specialist advice to CNS and Licensee's relating to each VAI submission as required. However, the relevant key features detailed in Section 7 below should be found in all VAI submissions forwarded by dutyholders to ONR.

6.3 Once the ONR SINS team has completed its assessment of potential VAs, the submission and the list of VAs should be examined by a CNS Inspector(s) with a comprehensive knowledge of the site's infrastructure and operations. Foremost, is the need to examine evidence in a dutyholder's submission to support claims and arguments made in the NSSP that adequate measures are in place, or are going to be put in place, for VA protection, that achieve the respective objectives detailed in the NORMS document. Where required, CNS Inspectors should seek additional information to support a dutyholder's claims where evidence appears to be missing from a submission. If the evidence is available it should be included in an updated submission. If the evidence is not available further work will be required by the dutyholder to substantiate claims.

6.4 Once accepted, the VAI submissions will provide information which is to be used as a basis for the VA protection detailed in NSSPs. The NSSP should refer to the current VAI submission and take account of its findings.

7. GENERAL FEATURES OF A VITAL AREA IDENTIFICATION SUBMISSION

7.1 General features of a good VAI submission should include the points summarised below. Subsequent sections of this guide translate these into more specific points. In general submissions should be:

a) **Complete.** Submissions should assume the loss of off-site power (LOOP) as this cannot be protected by a dutyholder. They should also take into account all plant states and consider both active and passive systems required to maintain plant safety. They should detail how the malicious capabilities in NIMCA could bring about an URC and take into account the graded approach identifying where a facility is a VA or High Consequence VA, as defined in the NORMS document at Part Three.

b) **Clear.** A submission should identify the objectives given in the NORMS document that need to be met, relevant malicious capabilities in NIMCA that need to be addressed, and the radiological consequences that could result. The submission should be understandable and easy to navigate to find relevant information. The basis for all assumptions, conclusions and recommendations in the submission, and unresolved issues, should be explained and justified. Clarity should extend to the correct referencing of supporting information.

c) **Accurate.** A submission should accurately reflect the plant, equipment and components. For a plant in design, the submission should accurately reflect the proposed build, with due consideration given to the state of the design development at that time.

d) **Objective.** The arguments developed in a submission should be supported with factual evidence and the necessary understanding of the behaviour of associated systems or processes should be established. In the absence of directly relevant information, the use of inferred or extrapolated detail should be carefully substantiated. There is also a need to provide visibility of the sensitivity to assumptions to validate the robustness of associated claims. The adequacy of respective operational procedures, managerial controls and resources should be demonstrated to an appropriate level.

e) **Appropriate.** Any analytical methods, such as Deterministic Safety Analysis (DSA) used by the dutyholder to substantiate safety arrangements in a VAI submission should be shown to be fit for purpose with adequate verification by the ONR SINS Team in conjunction with other safety inspectors. Any assumptions that have been made should be identified and shown to be appropriate.

f) **Integrated.** A submission should be holistic, with clear links between any engineering/technical substantiation. It should also define where VA protection depends on external facilities and services, and clearly substantiate any associated assumptions that are made.

g) **Current.** A submission should be current, concise and relevant. The content of a VAI submission may change if the plant/area concerned undergoes a major modification, or a series of minor modifications, which could also have a significant cumulative effect on radiological

consequences. The VAI process should also be repeated when design changes are being considered prior to their implementation, and whenever the threat in NIMCA has been updated. Where possible this process should be applied is in the design phase of a new facility to engineer out potential VAs.

h) **Forward looking.** A submission should demonstrate that the processes involved to identify VAs, will be regularly reviewed throughout the lifetime of the site/plant/area to ensure they remain valid and appropriate.

7.2 For ONR regulatory purposes, Part One of a NSSP comprises the Nuclear Security Case (NSC) (see CNS-TAST-GD-001, Revision 0). As far as VAs are concerned, the NSC is expected to:

a) reference and consider the malicious capabilities in the NIMCA document, taking account of the graded approach detailed in NORMS. This should include identifying the key assets that need to be protected, any threats the site faces, and VA security arrangements;

b) provide details of all identified VAs and the potential consequences of a successful sabotage attack against them; and

c) detail the findings of Vulnerability Assessments or, as required, a Gap Analysis with regard to sabotage (see the NORMS document and associated TAG CNS-TAST-GD-006, Revision 1).

8. PREPARATION OF A VITAL AREA IDENTIFICATION SUBMISSION

8.1 Preparation of a VAI submission should be based on a number of factors. These include the graded approach against sabotage and potential radiological consequences resulting from a successful attack (see Part One, Chapter 1, Annex C of the NORMS document). It should also be based on a thorough review of plant structures, systems and components (SSCs) and should take into account their location, physical separation, vulnerability to the threats detailed in NIMCA and the potential for the loss of protection they provide to lead to URC.

9. VITAL AREA IDENTIFICATION SUBMISSION

9.1 Some examples of points that need to be considered in a VAI submission are detailed in Appendix 1 to this TAG.

10. REVIEW AND PRODUCTION OF A REVISED VITAL AREA IDENTIFICATION SUBMISSION

10.1 It is important that a VAI is kept up to date and reviews are undertaken when any changes take place that could reduce, increase or change the status of VAs on site. Significant changes may also occur during operations, such as modification, incidents, revised lifetime plans, operational experience (OPEX) etc, or as a result of any changes to the NIMCA or NORMS documents. Such changes should be recorded and be taken forward as necessary in an updated VAI, which accurately reflects the current situation.

10.2 The responsibility for reviewing and producing a revised VAI submission, together with document control arrangements, should be clearly defined and detailed in the NSSP, as part of a dutyholder's compliance arrangements. This will include an appropriate timescale in which any submission will be reviewed. Suitably qualified and experienced staff should discharge these responsibilities.

10.3 Documentation which no longer forms part of a current VAI submission, or which has been superseded, should be archived in appropriate secure storage. This information still forms part of the formal audit trail, and should remain available for reference by the Duty Holder, security staff and ONR.

11. VITAL AREA IDENTIFICATION – PEER REVIEW, ASSURANCE AND GOVERNANCE

11.1 As part of the pre-submission process, a VAI should undergo an internal peer review by the dutyholder and be subject to an assurance and governance process. This process should ensure that:

a) appropriate methods and relevant safety and security standards and specifications have been used, and that the calculations used are correct;

b) the site/plant and operational details as documented are consistent with the actual site/plant and its operations;

c) where necessary, there has been independent verification or advice provided by suitably qualified and experienced staff;

d) where there has been any third party involvement, there is evidence of their competence to undertake the work, and evidence that where they have raised challenges these have been addressed and the VAI amended accordingly;

e) any evidence available from the dutyholder's internal audit function should confirm the VAI submission has been produced in compliance with relevant company procedures for the production of reports; and

f) the VAI is complete, all key security and safety assumptions are considered to be valid, and the Board member (or equivalent) for security has been briefed on all aspects of the submission and has endorsed the approach used for its production.

12. SUBMISSION OF A VITAL AREA IDENTIFICATION DOCUMENT

12.1 Once completed, dutyholders are expected to submit a VAI to ONR . ONR will then arrange for the SINS team to undertake an assessment of the technical content of the VAI to an agreed programme. .

13. REFERENCES

1. **Nuclear Industries Security Regulations 2003**. Statutory Instrument 2003 No. 403

2. **Nuclear Industries Security (Amendment) Regulations 2006**. Statutory Instrument 2006 No. 2815

3. **Nuclear Industries Security (Amendment) Regulations 2013**. Statutory Instrument 2013 No. 190

4. **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.

5. **IAEA Nuclear Security Series No. 16.** Identification of Vital Areas at Nuclear Facilities. November 2012. http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1505_web.pdf

6. **Nuclear Industries Malicious Capabilities Planning Assumptions.** 9 July 2012.

7. **National Objectives, Requirements and Model Standards**. October 2012. Trim Folder 4.4.2.11304.

8. **ONR Security Policy Framework**. Trim Folder 4.4.2.10457.

9. **Classification Policy for the Civil Nuclear Industry.** April 2016 Version 7.2. TRIM Reference 2016/216648

10. **Safety Assessment Principles for Nuclear Facilities**. 2006 Edition, Revision 1.

11. **Japanese earthquake and tsunami: Implications for the UK nuclear industry - Final Report**. ONR Report ONR-FR-REP-11-002 Revision 2. October 2011.

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

14. GLOSSARY AND ABBREVIATIONS

CNS	Civil Nuclear Security
CPPNM	Convention on the Physical Protection of Nuclear Material
DSA	Deterministic Safety Analysis
IAEA	International Atomic Energy Agency
LOOP	Loss of Off-Site Power
NIMCA	Nuclear Industries Malicious Capabilities Planning Assumptions
NISR	Nuclear Industries Security Regulations
NM	Nuclear Material
NORMS	National Objectives, Requirements and Model Standards
NSC	Nuclear Security Case
NSSP	Nuclear Site Security Plan
ONR	Office for Nuclear Regulation
OPEX	Operational Experience
ORM	Other Radioactive Material
PSA	Probabilistic Safety Analysis
SAP	Safety Assessment Principle
SINS	Security Informed Nuclear Safety
SNI	Sensitive Nuclear Information
SPF	Security Policy Framework
SSC	Structure, System and Components
TAG	Technical Assessment Guide
URC	Unacceptable Radiological Consequence
VA	Vital Area
VAI	Vital Area Identification

APPENDIX 1: EXAMPLE OF THE TYPE OF INFORMATION FOR INCLUSION IN A VITAL AREA IDENTIFICATION SUBMISSION

Introduction

1. It should be noted that once detailed information is provided as part of a VAI submission, the protective marking will be determined by the extent of the SNI in the submission.

2. This Appendix contains examples of the types of information that should be considered by a dutyholder and covered in a VAI submission. As the content is primarily concerned with technical issues on nuclear safety related aspects, the responsibility for the content and the ownership of this Appendix, as part of this TAG, rests with ONR's SINS team.

3. The aim of this Appendix is to help ensure a consistent approach is maintained across the inspection regime with regard to VA identification and it provides:

    a) information on the approaches that a dutyholder may use in developing their VAI submission; and

    b) guidance to ONR Safety Assessors and Security Inspectors on the information likely to be contained in a VAI submission.

4. The first step in performing VAI is to determine if the potential exists for an URC (see paragraph 7 b). If the potential exists it must then be determined whether it could be realised by a sabotage attack based on the threats within NIMCA. The inventories of NM or ORM present on the site, its potential hazard and its ease of dispersion will all need to be considered as part of this process. The following should be considered in a VAI study:

    a) the site (area in which the facility is located);

    b) site characteristics to determine the consequences of a potential radiological release;

    c) the locations, inventory, form, characteristics and quantities of associated NM and ORM;

    d) the relevant plant/facility safety functions (e.g. shielding, criticality prevention, cooling, confinement, fire prevention, structural integrity);

    e) the detailed design information on process and safety systems needed to identify the equipment, systems, structures, components, (SSCs) and devices, that require protection to prevent URCs; and

    f) the actions taken by a member of the site staff, which could make a contribution to or give rise to a URC.

5. The onus is on the dutyholder to explain, demonstrate and, where appropriate, provide evidence that the VAI submission is the result of a detailed analysis of the plant/facility's SSCs and takes account of the threat from sabotage.

Review of safety documentation

6. In the early stages of the VAI process, the dutyholder must identify which functions and services are required to maintain a safe operating state, the loss of which could give rise to a URC. A good understanding of the function and requirements of the plant/facility should be demonstrated in the VAI submission.

Site Specific Considerations

7. The dutyholder should produce a VAI submission based on site-specific considerations. These should include the normal operating, shutdown and maintenance conditions, and consider how vulnerability might be exploited in one plant condition to affect a subsequent plant condition. For example, a device could be planted during maintenance and activated when the plant is operating.

8. A VAI submission should focus on identifying whether a VA exists at a site and how the threats given in the NIMCA could be used to achieve a URC.

9. Both the dutyholder's team that produces the VAI study and the ONR SINS team assessing it must have a good understanding of the effects NIMCA threats can produce. This understanding should be used to determine where systems which are functionally separate could be affected by a single event, and where damaging a structure could directly or indirectly cause an URC. Where diverse and redundant systems are used to prevent an URC, the number of potential threats detailed within the NIMCA, and their effect, should be considered.

10. A dutyholder's VAI team should determine the potential radiological consequences of the scenarios which give rise to each VA. The application of this information will determine the categorisation of the VA using the graded approach as defined in NORMS. In all cases the calculation of radiological consequences should be based on conservative, but realistic assumptions, and on up-to-date data and information. This should be undertaken without considering the physical protection and mitigation measures at the site.

11. For all sites, LOOP should be addressed as part of the identification process.

Principle functions which may be used to prevent a URC

12. The VAI process should identify whether any malevolent act using the threats detailed within NIMCA has the potential to cause a URC.

13. As part of the VAI process it should be recognised that to prevent an URC, nuclear plant design employs systems to preserve all three radiation safety functions – confinement, cooling and control.

Confinement, Containment or Shielding

a) The confinement function on nuclear facilities is designed to confine nuclear material within the facility and prevent its leakage into the environment in normal operation or fault conditions.

b) The confinement function is often performed by some form of containment system. Containment systems encompass a range of structures and plant, from massive buildings surrounding power reactors to glove boxes, individual packages and containers.

c) Containment systems provide shielding to protect both the operators and public from the direct effects of radiation.

Cooling (or heat removal)

a) The heat removal systems on nuclear facilities are designed to ensure that temperatures remain within the safe limits for normal operation or fault conditions.

b) A dutyholder's VAI team should identify any potential vulnerabilities to cooling/heat removal systems from the NIMCA threats. Should reliance be placed on systems that require some form of manual intervention, it can only be claimed if the safety of staff is assured. Time available to initiate the cooling system and the required operating time will have to be analysed to support any arguments within the study.

Control of reactivity (including criticality)

14. The VAI study must consider the possibility of a malicious act affecting the control of reactivity, including criticality, where this could give rise to an URC.

Malicious Acts

15. The dutyholder's VAI team should determine which malicious acts require consideration and justify those that are not included. The use of bounding cases may also be appropriate, and these should also be justified and documented. The study should show that the potential effects produced by the NIMCA threats have been recognised and considered appropriately (whether separately or in combination as defined in NIMCA).

Functional analysis

16. The VAI submission must consider whether any of the NIMCA threats have the potential to disrupt any function which is required to prevent an URC. It must consider the possibility of separate and/or diverse systems being affected by a single threat if they are all located within the damage radius of that threat. This also applies to systems which are dependent on the supply from utilities, as these must be considered from end to end.

Engineering analysis

17. The engineering analysis approach uses a methodology that considers where the materials that can cause an URC are located and then develops methods to disperse the material. The safety measures or functions that if they are removed, bypassed or made to fail would lead to an URC are then identified.

18. The engineering analysis should consider the extent of damage which can be suffered by the systems, structures and components on the site as a result of the threats within NIMCA and determine at what point these then fail to fulfil their function.

19. The use of event trees can help to demonstrate the interdependence and interaction between systems and/or elements required to prevent an URC. Reviewing these event trees against the effects of the threats within the NIMCA can highlight potential VAs. Where this approach is adopted the potential for more than one system to be impaired by each of the NIMCA threats must be considered. Understanding the effects the NIMCA threats can generate and the location of the systems being considered is needed to undertake this part of the review. A key part in understanding this is the VA walkdown (see paragraph 25).

Site maps and building plans

20. The inclusion of site maps, detailing the location of critical SSC, is needed in submissions to help confirm the segregation of features to be confirmed rather than just their separation and redundancy.

21. The inclusion of service runs, pipe work and cable routes can also aid understanding, as there is the potential for multiple systems to be lost through one action.

Equipment Unavailability

22. Although the VAI process focuses on the consequences of malicious acts, equipment unavailability could conceivably occur by chance, or as a result of maintenance outages, concurrent with a malicious act. The results of the VAI need to be deterministic; that is, an area is either vital or it is not. Therefore, the VAI study should consider all recognised plant states and be revised should there be any significant changes to the plant or its status.

Walkdown

23. Information should be verified by the dutyholder's VAI Team through a VAI plant walkdown, in order to:

    a) verify arguments made within the study and determine whether any additional vulnerabilities exist;

    b) verify the areas from which relevant NIMCA threats could cause direct dispersal;

    c) verify those areas from which the NIMCA threat could disable equipment, SSCs, and devices or prevent key operator actions from taking place; and

d) assess the potential for spatial interactions between adjacent areas.

24. Additional consideration is required to address spatial interactions between adjacent areas. There may be cases in which a malicious act in one area can disable equipment, components, or devices in one or more adjacent areas. This requires a sound understanding of the potential damage which could result from the threats within NIMCA. The SINS assessment of the VAI study may include a walkdown of the plant with the dutyholder to confirm the validity of the arguments presented.