Defence
Safety Authority

DSA03–DNSR

Defence Nuclear Safety Regulations of the Defence Nuclear Enterprise – Guidance

(Version 1.0 May 2021)

Defence Nuclear
Safety Regulator

DNSR

Amendment Record

Version	Issued	Author	Review
1.0	May 2021	DNSR NWR / DNSR NPR	May 2024

Note

The DSA03–DNSR Defence Nuclear Safety for the Defence Nuclear Enterprise – Guidance has been developed from the now withdrawn JSP518 and JSP538 Guidance, in line with DSA documentation policy. DSA03–DNSR replaces the JSP518/538 Part 2: Guidance.

Contents

Authority

DSA03–DNSR Purpose, Scope and Structure

1. The Defence Safety Authority (DSA) issues publications on Health, Safety & Environmental Protection (HS&EP) in a hierarchy of three levels. Level 1 publications are DSA policy documents (DSA01 series). Level 2 documentation are the Defence regulations owned by the Defence Regulators (DSA02 series). DSA02–DNSR Defence Regulations of the Defence Nuclear Enterprise - Regulations is a part. The DSA02–DNSR regulations define and promulgate the requirements for nuclear and radiological safety of the Naval Nuclear Propulsion Programme (NNPP) and the Nuclear Weapon Programme (NWP) activities.

2. DSA Level 3 documents (DSA03 series) comprise the associated guidance supporting the DSA02 Regulations and DSA03–DNSR Defence Regulations of the Defence Nuclear Enterprise – Guidance is part of the DSA03 suite of documents. This document applies to all life cycle phases of the DNE.

3. DSA03–DNSR Defence Regulations of the Defence Nuclear Enterprise is structured into advice for DNSR Inspectors, Authorisees and duty holders, and more general information of value.

How to use this Defence Safety Regulatory Publication

4. DSA02–DNSR and DSA03–DNSR Defence Nuclear Safety Regulations and Guidance for the Defence Nuclear Enterprise and supporting documents form the Defence Nuclear Enterprise nuclear safety regulatory framework. These documents are to be used by staff responsible for the planning, management, supervision and execution of Defence nuclear activities worldwide, including members of the armed forces, civilian employees, and others, including contractors. These regulations do not replace legislative obligations. Full reference is to be made to national and international regulations and legislation and where applicable, Host Nation requirements.

5. DSA03–DNSR Defence Nuclear Safety Regulations of the Defence Nuclear Enterprise – Guidance, replaces the “Part 2: Guidance” from the Following JSPs:

JSP 518 – Regulation of the Naval Nuclear Propulsion Programme V4.1 Jul 14

JSP 538 – Regulation of the Nuclear Weapon Programme V3.1 Jul 14

6. DSA03–DNSR Defence Nuclear Safety Regulations of the Defence Nuclear Enterprise – Guidance, provides regulatory advice and guidance to DNSR Inspectors, Authorisees and duty holders in support of Defence Nuclear Enterprise activities that will assist the user to comply with regulations. However, alternative approaches may be utilised where this produces an outcome as good as required by regulation. The guidance and advice contained herein may be used to support Regulatory Enforcement Action.

7. Annex A of DSA03–DNSR provides guidance for DNSR Inspectors and Authorisees on each of the 36 Authorisation Conditions, the six Further Authorisation Conditions and the Transport Condition. Guidance against each Condition also indicates a number of other sources of guidance for Authorisees and duty holders to consider when demonstrating

compliance. Further sources of guidance are not intended as prescription and Authorisees and duty holders may consider the use of other relevant guidance where appropriate.

8. Annex B provides guidance primarily for DNSR Inspectors on regulatory processes and activities utilised by DNSR during its regulation of the DNE. The guidance, however, may be of interest to duty holders in providing information on how DNSR undertakes regulatory activities.

9. Annex C provides guidance on other related specific topics. Currently, this Annex refers to the DNSR Guide to an Application for UK Defence Nuclear Programme Competent Authority Approval of a Transport Package for Radioactive Material. This guide is currently under revision. This Annex will be updated periodically as additional specific DNSR guidance is published.

10. Annex D provides guidance for DNSR Inspectors, Authorisees and duty holders on the application of relevant good practice (RGP). The Annex seeks to provide guidance how the use of RGP is aligned with the Secretary of State for Defence (SofS) policy on HS&EP, and how the use of RGP can support the demonstration of ALARP.

11. Annex E provides guidance on the application of ALARP and the use of tolerability arguments in the defence context. DNSR requires the demonstration of ALARP in safety cases, as part of the requirement to meet SofS Policy on HS&EP. Annex E also considers the application of tolerability of risk to defence and the treatment of defence imperatives.

12. Annex F provides guidance on the MOD Design Authority Function in the Defence Nuclear Enterprise. The guidance seeks to provide information on the role of the Design Authority Function as applied to the Naval Reactor Plant and Nuclear Weapon context.

13. Annex G provides guidance for DNSR Inspectors on Leadership and Management for Safety. L&MfS is not regulated via a specific AC, but its demonstration is highly important in terms of a positive culture for safety. Expanded guidance on L&MfS is under development by DNSR and will be published in due course.

14. Annex H provides high level guidance on Security Informed Nuclear Safety (SINS). Authorisees should engage with both DNSR and DefNucSyR when considering SINS in safety cases.

15. Annex I provides an interpretation of the ONR Safety Assessment Principles for the NNPP. This section was originally developed at the time of ONR SAP publication, and wider knowledge of the SAPs within the DNE may limit the utility of this guidance. This guidance is under review any may be removed from future issues of DSA03–DNSR.

16. Annex J are NWR Safety Assessment Principles. Annex J is principally for the use of DNSR Inspectors, but may be of interest for NW Authorisees. This section is unchanged from JSP538 V3.1 and will be reviewed and updated after completion of the DNO NW safety policy review to be undertaken during 2021.

17. Annex K lists the currently published DNSR Technical Assessment Guides. Copies of guides are available for Authorisees from DNSR upon request.

18. Finally, Annex L provides an overview of relevant UK legislation to the DNE.

The Regulators' Code

19. The Regulators' Code, which was laid before Parliament in accordance with section 23 of the Legislative and Regulatory Reform Act 2006, requires Regulators to give regard to the code when developing policies and operational procedures that guide their regulatory activities. Regulators must equally have regard to the Code when setting standards or giving regulatory guidance which may guide the activities of other regulators.

20. The DSA Charter requires Defence Regulators to operate in a manner consistent with UK good practice for regulation as presented in the Regulators' Code. Paragraph 5 in the DSA Charter states:

a. "in each domain or functional area it shall be the duty of the Defence Regulator to maintain, promulgate, assure compliance with, and when necessary, enforce Defence Regulations and to promote an engaged safety culture…"

21. The Regulators' Code defines six provisions which should be considered by regulatory bodies, and the DNSR Strategy 2020-2025, includes each of the stated provisions.

- DNSR will conduct its activities in a way that supports Authorisees to comply and grow.
- DNSR will develop simple and straightforward ways to engage with Authorisees and hear their views.
- DNSR will base its regulatory activities on risk.
- DNSR will share information about compliance and risk.
- DNSR will ensure that clear information, guidance and advice is available to help Authorisees meet their responsibilities to comply.
- DNSR will ensure that its approach to regulatory activities is transparent.

Primary and Derived powers

22. In conducting regulatory business, DNSR, where appropriate may apply its Primary or Derived powers:

Primary: These are the DNSR powers associated with the Authorisation Conditions, Further Authorisation Conditions and Transport Condition, for instance, the power to Direct an Authorisee to take action e.g.to submit such documentation as DNSR may specify, or the power to Direct the Authorisee to halt decommissioning of nuclear plant. The Authorisation Conditions provide six primary powers comprising "Consent", "Approval", "Direction", "Notification", "Specification", and "Agreement".

Derived: These are powers granted to DNSR through the Authorisee's arrangements made to satisfy certain Authorisation Conditions, for instance

powers to permission selected activities through the identification of hold points. They are also known as secondary powers.

23. Authorisee arrangements may grant DNSR derived powers as appropriate. For example, an Authorisee may wish DNSR to agree to the lifting of a internally defined hold point as a derived power, as opposed to DNSR specifying a regulatory hold point as a primary power beyond an existing set of Authorisee defined hold points.

Annex A: Guidance on the Application of the Authorisation Conditions

AC1 Guidance Note	Interpretation
AC2 Guidance Note	Marking of the Site Boundary
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AC15 Guidance Note	Periodic Review
AC16 Guidance Note	Site Plans, Designs and Specifications
AC17 Guidance Note	Management Systems
AC18 Guidance Note	Radiological Protection
AC19 Guidance Note	Construction or Installation of New Plant
AC20 Guidance Note	Modification to Design of Plant Under Construction
AC21 Guidance Note	Commissioning
AC22 Guidance Note	Modification or Experiment on Existing Plant, Nuclear Weapon, Naval Reactor Plant, Component or Relevant Support Equipment
AC23 Guidance Note	Operating Rules
AC24 Guidance Note	Operating Instructions
AC25 Guidance Note	Operational Records
AC26 Guidance Note	Control and Supervision of Operations
AC27 Guidance Note	Safety Mechanisms, Devices and Circuits
AC28 Guidance Note	Examination, Inspection, Maintenance and Testing
AC29 Guidance Note	Duty to Carry Out Tests, Inspections and Examinations
AC30 Guidance Note	Periodic Shutdown
AC31 Guidance Note	Shutdown of Specified Operations
AC32 Guidance Note	Accumulation of Radioactive Waste
AC33 Guidance Note	Disposal of Radioactive Waste
AC34 Guidance Note	Leakage and Escape of Radioactive Material and Radioactive Waste
AC35 Guidance Note	Decommissioning
AC36 Guidance Note	Organisational Capability
FAC1 Guidance Note	Duty of Co-operation
FAC2 Guidance Note	Operational Berths
FAC3 Guidance Note	Radioactive Discharges
FAC4 Guidance Note	Unused
FAC5 Guidance Note	Design of a Nuclear Weapon or Naval Reactor Plant
FAC6 Guidance Note	Nuclear Weapon Periodic Withdrawal
TC1 Guidance Note	Transport, Packages and Containers

24. In the assessment of Authorisees' (including Authorisees with Design Authority responsibilities for the nuclear weapon, naval reactor plant, components or relevant support equipment) Authorisation Condition compliance, DNSR may utilise the guidance in the following sections. Additionally, sources of relevant good practice are provided in tabular form under each Condition, which DNSR will consider as examples and benchmarks of industry standards. However, the tables are neither prescriptive nor exhaustive, and Authorisees are should apply RGP as appropriate to the activity being conducted. A justification that nuclear and radiological risk is ALARP is fundamental to nuclear safety. Further guidance on the application of RGP and how this relates to the legal duty for Authorisees to reduce risks ALARP can be found at Annex E.

25. As stated in DSA02–DNSR, Authorisees are required to comply with all Authorisation Conditions. However, DNSR will consider cases for the disapplication of a Condition on a case by case basis. Authorisees should discuss cases for disapplication in the first instance via the appropriate DNSR Inspector.

Regulation AC1 Guidance Note

Interpretation

Introduction

1. The purpose of this Condition is to ensure there is no ambiguity in the use of certain specified terms which are found in the text of the Conditions. It also contains important powers for DNSR to modify, revise or withdraw approvals etc. and to approve modifications to any matter currently approved. Where appropriate, references are made back to the relevant statutory Acts of Parliament.

Scope

2. This guidance relates to the definitions and meanings of the DNSR primary powers.

Guidance to Authorisees

3. The following regulatory controls are used throughout the conditions and have the following definitions and meanings:

Consent

Explanation: A consent is required before an Authorisee can carry out an activity for which DNSR has so specified the need.

Reason for use: A consent is used to ensure an Authorisee does not carry out an activity before DNSR has been satisfied that the proposed course of action is safe and all necessary procedures and controls are in place.

Approval

Explanation: An Authorisee is required to submit its arrangements for approval if so specified by DNSR.

Reason for use: An approval is used to freeze an Authorisee's arrangements. Once approved no alteration or amendment can be carried out without further approval by DNSR.

Direction

Explanation: A direction requires an Authorisee to take a particular action.

Reason for use: A direction is used for matters of safety importance.

Agreement
Explanation: An agreement issued by DNSR allows an Authorisee to proceed with an agreed course of action.

Reason for use: Where the need to obtain DNSR's agreement is written into the Authorisee's arrangements, it prevents an Authorisee from proceeding unless the course of action has been agreed.

Notification
Explanation: When so notified, an Authorisee is required to submit information to DNSR.

Reason for use: A notification to an Authorisee is used to request the submission of information to DNSR.

Specification
Explanation: A specification issued by DNSR requires an Authorisee to implement the specified arrangements.

Reason for use: A specification is the means by which DNSR can implement discretionary control over an Authorisee's arrangements.

4. To differentiate between the use of these terms by DNSR and other organisations, the terms may be prefixed by 'DNSR' or 'regulatory'.

Regulation AC2 Guidance Note

Marking of the Site Boundary

Introduction

1. The purpose of this Condition is to ensure that the Authorisee takes the necessary steps to prevent unauthorised access to those parts of the Authorised site that DNSR specifies in order to prevent unauthorised persons entering the site and injuring themselves or damaging safety related plant or equipment.

Scope

2. This guidance relates to the identification, marking, inspection and maintenance of security by fences or other appropriate means around the sites, facilities, NPW or transportation, which are subject to Authorisation.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. Clear identification, using maps and plans as necessary, of the coverage of Authorisation. For sites, this should include a definition of any sea areas and the seaward boundary. This includes an indication of access controls, including both within and around any NPW and transportation.

b. Identification of the lines of responsibility for the control of access between individuals within Authorised Sites across Life Cycle Phases and between Authorisees.

c. Any special precautions taken to prevent unauthorised entry, including patrols, manning and controls during movements. Fences, boundary markings, signs etc. should be provided as appropriate, not only warning of the restricted nature of an area but also giving hazard and emergency action information. See also Authorisation Condition 8 (AC8).

d. The arrangements for the definition, inspection and maintenance of boundary markings, identification, fences, signs, etc. including identification of those persons with the responsibility for carrying out such inspection and maintenance.

4. It is DNSR policy that all Defence Nuclear Enterprise activities will, as far as is practicable, be subjected to Authorisation. However, the Office for Nuclear Regulation (ONR) Licenced Site boundaries are recognised by DNSR and are not required to be separately marked as Authorised site boundaries. As such, this Condition does not require those Authorisees who are also licensed to apply measures in addition to those which satisfy ONR Licence Condition 2 (LC2) if Authorised and Licensed Site boundaries are identical.

5. Where a Licensed Site has an attached area in which relevant activities are undertaken by the same Licensee, but are not licensable activities under Nuclear Installations Act 65, AC2 will apply to that area. Hence the Authorisees' site will encompass all their relevant activities and compliance will be covered by the evidence provided by the Authorisee against LC2 for the licensed activities and AC2 for the remaining Authorised activities.

6. Whilst the assessment of the adequacy of security requirements implemented to prevent unauthorised access falls outside the scope of DNSR regulation[1], due credit will be given where such security arrangements effectively enhance the safety arrangements for restricted access.

Further Sources of Guidance

7. The table below lists further guidance relevant to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-002	LC2: Marking of the Site Boundary
IAEA Standards	SSR-1	Site Evaluation for Nuclear Installation
ONR Security Assessment Principles	ONR SyAPs, 2017 Edition, Version 0	ONR Security Assessment Principles for the Civil Nuclear Industry Fundamental Security Principles, FSyP 5, 6, 9

[1] Security Regulation of the DNE is described in JSP628

Regulation AC3 Guidance Note

Restrictions on Dealing with the Site

Introduction

1. The purpose of this Condition is to ensure that the Authorisee does not let, convey, assign or transfer any part of the nuclear Authorised site to a third party without seeking the consent of DNSR. This is to ensure that the Authorisee does not change the character of the activities that are Authorised and to prevent activities being carried out on the site which could put nuclear operations at risk. It is essential that nothing confuses the absolute responsibility of the Authorisee in respect of safety on the whole Authorised site. The Authorisee should be able to demonstrate that there are organisational procedures to prevent individuals within the company from conveying, assigning, transferring or granting any Authorisations in relation to the site or parts of the site without first obtaining the consent of DNSR.

Scope

2. This guidance relates to the letting, conveying, assigning or transferring of any part of the nuclear Authorised site to a third party without first seeking and obtaining the permission of DNSR.

Guidance to Authorisees

3. The Authorisee should include a simple but enforceable statement in their documented arrangements to the effect that they will not let, convey, assign, transfer or grant any Authorisation in relation to the site, Nuclear Powered Warship or transportation under their control without first obtaining DNSR's consent.

4. Authorisees should note that FAC1 guidance now covers the previous ADAC3 guidance.

Further Sources of Guidance

5. The table below lists further guidance relevant to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-003	LC3: Control of Property Transaction
ONR Technical Assessment Guide	ONR NS-TAST-GD-087	Control of Property Transactions on Licensed Sites
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	ONR Safety Assessment Principles for Nuclear Safety

Regulation AC4 Guidance Note

Restrictions on Nuclear Matter on the Site

Introduction

1. The purpose of this Condition is to ensure that the Authorisee has adequate arrangements to ensure the safety and control of the introduction and storage of nuclear matter on the Authorised site. The Condition provides DNSR with powers to specify that certain types of nuclear matter cannot be brought onto the site without the consent of DNSR. This enables DNSR to intervene to ensure that, for specific activities, it can assess the adequacy of the Authorisees' arrangements before nuclear matter is brought onto the site. (Nuclear matter being nuclear fuel, radioactive waste, etc. as defined by the Nuclear Installations Act).

Scope

2. This guidance relates to the arrangements for controlling nuclear matter being brought onto or stored on an Authorised site or NPW, moved within an Authorised site and for the production and keeping of records pertaining to such matter.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel who are responsible for the processing, recording and storing of radioactive matter.

b. The arrangements for ensuring that no nuclear matter is brought onto or stored on the Authorised site or NPW or moved within the Authorised site, unless:

(1) a safety case for the handling, storage or transport of that matter is in place;

(2) the Conditions and Limits of Safe Operation have been defined;

(3) operating instructions have been issued to ensure that the conditions and limits of safe operation are observed.

c. Authorisee arrangements should also indicate the type and form of nuclear matter, the method of storage and how traceability of the matter will be achieved. These arrangements should include how any radioactive matter brought onto the Authorised site or NPW is managed.

d. Authorisee arrangements should include a safety justification for the use of all transport, storage flasks, packages and containers.

e. The Authorisee should have appropriate SQEP to undertake Consignee activities, in accordance with relevant legislation and international agreements.

f. The arrangements for ensuring that no nuclear matter is brought onto a site or NPW for the first time without the consent of DNSR.

g. The arrangements for the production and keeping of all records which pertain to the introduction, storage, processing and transfer of nuclear material.

4. Where matter is to be transferred between Authorisees then the arrangements must reflect the duty of co-operation between Authorisees (and the carriers where applicable). See FAC1 for additional guidance.

5. DNSR will not normally wish to be involved in the movement or use of sealed sources used for radiography except where there is a potential hazard which needs to be taken into account by the safety management arrangements. Further guidance on High Activity Sealed Sources is given in AC25 guidance notes.

Further Sources of Guidance

6. The table below lists further guidance relevant to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-023	Control of Processes Involving Nuclear Matter.
	ONR NS-TAST-GD-041	Criticality Safety.
ONR Technical Inspection Guides	ONR NS-INSP-GD-004	LC4: Restrictions on Nuclear Matter on the Site.
IAEA Nuclear Security Series	NSS-14	Nuclear Security Recommendations on Radioactive Material and Associated Facilities
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Safety
UK Government Legislation	-	The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009
United Nations Economic Commission for Europe Agreement	-	European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)
Convention concerning International Carriage by Rail	Appendix C	Regulations concerning the International Carriage of Dangerous Goods by Rail (RID)

Regulation AC5 Guidance Note

Consignment of Nuclear Matter

Introduction

1. The purpose of this Condition is to ensure that the transfer of nuclear matter, other than excepted matter and radioactive waste, to sites other than Authorised or regulated sites is carried out only with the consent of DNSR, and that the Authorisee maintains adequate records of all nuclear matter, including excepted matter and radioactive waste, consigned from the site regardless of its destination.

2. This Condition is aimed at ensuring not only that there is a record of where nuclear matter has been sent to, but also so that DNSR can be sure that there are adequate arrangements for safely handling such material at the destination.

Scope

3. This guidance relates to the consignment of nuclear matter to sites other than Authorised or regulated sites and the requirement for making and preserving a record of all consignments of nuclear matter, including excepted matter and radioactive waste.

Guidance to Authorisees

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for the consignment of nuclear matter.

b. The arrangements for ensuring that nuclear matter, including excepted matter and radioactive waste, is consigned only to an Authorised or regulated site, unless specific consent is sought from DNSR for the consignment of nuclear matter to any place other than an Authorised or regulated site.

c. The Authorisee should have appropriate SQEP to undertake Consignor activities, in accordance with relevant legislation and international agreements.

d. The arrangements for recording details of all consignments of nuclear matter, including excepted matter and radioactive waste.

e. The arrangements for ensuring the preservation of records for the specified period.

5. Any change in the Authorisee responsible for nuclear matter should be regarded as a consignment of nuclear matter from one Authorisee to another.

6. For consignment of nuclear matter (including excepted matter and waste) from a licensed Defence Nuclear Enterprise site to a non-Defence Nuclear Enterprise site, the consent of ONR will be accepted by DNSR.

Further Sources of Guidance

7. The table below lists further guidance relevant to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-005	LC5: Consignment of Nuclear Matter
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Safety, SAPs ENM.2-3.
UK Government Legislation	-	The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009
United Nations Economic Commission for Europe Agreement	-	European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)
Convention concerning International Carriage by Rail	Appendix C	Regulations concerning the International Carriage of Dangerous Goods by Rail (RID)

Regulation AC6 Guidance Note

Documents, Records, Authorities and Certificates

Introduction

1. The purpose of this Condition is to ensure that adequate records are held by the Authorisee for a suitable period to ensure that the safety case for operation is available at all times, and for example that design and construction information is available for decommissioning, that design and operational records are available to assist investigations in the event of an accident or incident and operational records are available for the statutory number of years after the cessation of operations for the purpose of assisting any claims of damage to health as a result of exposure to ionising radiation.

Scope

2. This guidance refers to the management of records associated with the Authorisation Conditions and statutory requirements.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for the production of documents, records, authorities and certificates and for the preservation of all documentation.

b. The arrangements and keeping of records of:

(1) the accumulated effective dose to all personnel who have been employed on Defence Nuclear Enterprise activities;

(2) personnel health records; and

(3) any reports investigating over-exposure;

for 50 years after completion of last entry. All other records relating to the control of exposure such as monitoring, dosimetry service, radioactive substance accounting etc.

should be kept for as long as required by statute. Records are a means of demonstrating that statutory requirements have been met.

c. The management arrangements for controlling documentation and how its storage and preservation is carried out, including the generation of a record retention schedule, record schedules and the means of record retrieval. This should take account of the challenge of obsolescence of hardware and any associated software, and also loss of operator skills. Arrangements should demonstrate how the continued viability of the records is maintained and how often the recording method is subject to periodic review for its longevity.

d. The arrangements for assessing the minimum time scale for the maintenance of records unless agreement to the contrary has been reached with DNSR.

e. The arrangement for safeguarding records against hazards which may render the records unusable. These hazards include such events as fire, flood and adverse environments. Safeguards may include duplication of records or high integrity storage.

f. The maintenance of adequate records for design, safety justification, production, testing, operation, support, modification and decommissioning is essential to the long-term safety of the Defence Nuclear Enterprise and to satisfy legislative requirements.

Additional Guidance to Authorisees with Design Authority Responsibilities

4. Consideration should be given to the following:

a. The management structure, responsibilities and interactions between associated organisations, committees and individuals.

b. The maintenance of adequate records of the design, safety justification, production, testing, operation, support, modification and decommissioning of nuclear weapons, naval reactor plant, components and relevant support equipment.

Further Sources of Guidance

5. The table below lists further guidance relevant to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-006	LC6 Documents, records, authorities and certificates
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Safety SAP MS.2
IAEA Standards	SSG-50	Operating Experience Feedback for Nuclear Installations
	TECDOC-1600	Best Practices in the Organization, Management and Conduct of an Effective Investigation of Events at Nuclear Power Plants.

Regulation AC7 Guidance Note

Incidents

Introduction

1. The purpose of this Condition is to ensure that the Authorisee has adequate arrangements to deal with incidents (as defined in DSA02–DNSR) that may occur. In accordance with Authorisation Condition 7, DNSR requires an Authorisee to make and implement adequate arrangements for the notification of incidents, their subsequent investigation and assessment, and the reporting of the investigation to DNSR.

Scope

2. This guidance relates to the notification, recording, investigation and reporting of incidents, including conditions and anomalous conditions that may affect nuclear or radiological safety on an Authorised site, or of the nuclear weapon, naval reactor plant, component or relevant support equipment. The guidance also relates to the provision of Design Authority support where required and also includes the communication of lessons learnt.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management structure and responsibilities of all personnel responsible for reporting incidents and conducting investigations and the interactions and integration of management arrangements between associated Authorisees (including those with Design Authority responsibilities), organisations, committees and individuals involved.

b. The arrangements for reporting, investigating, reviewing and assessing all incidents and anomalous conditions directly or indirectly affecting nuclear or radiological safety, including the notification of incidents to DNSR.

c. The arrangements for the categorisation of incidents against the International Nuclear Events Scale.

d. The arrangements for:

(1) appointing personnel to implement and supervise the arrangements;

(2) categorising incidents, occurrences and deviations. The assigned categorisation should include consideration of any through life safey issues that could potentially arise from the event, as well as any immediate safety issues;

(3) ensuring staff awareness of the need for reporting incidents and events;

(4) ensuring an open approach to the reporting and assessment of incidents;

(5) specifying the appropriate level of investigation;

(6) referring the reports to the Authorisee Nuclear Safety Committee and to DNSR;

(7) implementing recommendations;

(8) ensuring staff awareness of the lessons learned from incidents and anomalous events;

(9) reviewing and analysing all incidents and anomalous events occurring elsewhere and applying any applicable lessons learned;

(10) analysing incidents and anomalous events occurring elsewhere including from internal and external sources and applying any applicable lessons learned;

(11) auditing the incident reporting and assessment system;

(12) providing an annual report to the respective safety committee on the effect of incidents on the validity of the respective safety case

(13) the control and storage of documentation recording incidents.

4. The Condition requires the Authorisee to notify DNSR of all incidents with the potential to adversely affect nuclear or radiological safety in timescales consistent with ONR practice. This will enable DNSR to fulfil its duties under the defence ministerial reporting requirements. The timing of the notification will depend upon the safety significance or regulatory profile of the incident or event and will range between:

a. immediate notification by pager, telephone or fax;

b. notification on the next working day;

c. notification on the next inspectors visit;

d. notification during the Inspectors review of the Authorisees event reporting process.

5. The Condition requires Authorisees to provide routine reports covering all safety related incidents not falling into the more serious category above (para 4).

6. The Condition requires the Authorisee to inform DNSR of the assessment of incidents.

7. The Condition requires DNSR to be informed of any other incident, event or occurrence that might attract public and/or media attention.

8. Where an incident is reported to statutory regulators under equivalent reporting arrangements (e.g. INF1 reporting to ONR on a Licensed Site) the Authorisee should also verbally inform the relevant DNSR inspector, followed by formal notification through information copies of the statutory notification.

9. The Authorisee should notify DNSR using the DNSR ENF1 proforma where Authorisee arrangements do not provide the same functionality or information. Transport events are to be notified to DNSR using the DINF1 form in all instances. Authorisees should seek the latest versions of DINF1 and ENF1 proformas from DNSR.

10. The Authorisee should submit proposals covering the period for retention of records relating to incidents for agreement by DNSR.

Additional Guidance for Authorisees with Design Authority Responsibilities

11. Consideration should also be given to the following:

a. The arrangements governing the notification, recording, investigation and reporting of anomalous conditions revealed through Design Authority activities. The arrangements should include:

(1) the processes and procedures employed to compile, approve, maintain the arrangements up to date;

(2) the processes and procedures necessary to integrate with other Authorisees' management arrangements; and

(3) the arrangements for alerting and advising other Authorisees and DNSR.

b. The arrangements for co-operation with the Authorisee in categorisation of accidents, incidents and anomalous events.

Further Sources of Guidance

12. The table below lists further guidance relevant to this AC.

Technical Inspection Guides	ONR NS-INSP-GD-007	LC7 “Incidents on the Site” and Other Reporting and OE Processes
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Safety SAPs FP.6-7
IAEA Standards	SSG-50-2.11	A System for the Feedback of Experience from Events in Nuclear Installations
	TECDOC-1600	Best Practices in the Organization, Management and Conduct of an Effective Investigation of Events at Nuclear Power Plants.

Regulation AC8 Guidance Note

Warning Notices

Introduction

1. The purpose of this Condition is to ensure that all people on the Authorised site, nuclear powered warship or those involved in other nuclear safety related activities, are made aware of potentially hazardous situations and can respond appropriately and without delay to an emergency situation. The Authorisee therefore needs to ensure that all warning notices are in appropriate places to advise people on what to do in that area in the event of a fire or any other emergency.

Scope

2. This guidance relates to the placing of notices on site, nuclear powered warship or during transportation to ensure that personnel, visitors and contractors are made aware of:

a. the meaning of any warning signal;

b. the location of emergency exits or exit routes;

c. the actions to be taken in the event of an emergency.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for the arrangements that ensure that there are appropriate, sufficient, up-to-date and suitably positioned notices and signs that denote potential hazards, explaining the meaning of all warning signals and identifying the measures to be taken in the event of an emergency.

b. The arrangements that ensure all escape routes, emergency exits and equipment, and assembly points are clearly marked and are not obstructed.

c. The review arrangements that ensure all notices and signs remain valid and are maintained in a legible condition, including the recording of such reviews. It should be

recognised that notices and signage may vary depending on the activity being undertaken and periods when normal operation may be disrupted.

d. The arrangements for ensuring that the dependence upon notices and signs is consistent with the training and briefings which should be given to personnel, including visitors and contractors who may not be familiar with local arrangements.

e. Warning notices and signs should be sufficiently clear to avoid confusion between the response to nuclear and non-nuclear emergencies.

f. A 'warning sign' is defined as a notice which states one or more of the following:

(1) the meaning of a warning signal;

(2) the hazard associated with a warning signal;

(3) the action to be taken by individuals in response to a warning signal in order to avoid or minimise exposure to the hazard associated with the signal.

4. Notices and safety signs associated with the required response, e.g. signs for emergency exits, evacuation routes and muster points, and the location of emergency equipment, should be classed as warning notices.

5. A warning signal is an acoustic signal and/or illuminated sign used to indicate an accident or emergency condition requiring the person(s) hearing/seeing it to take specific action to protect themselves from harm, e.g. a fire alarm. Alarms that require action solely to maintain a process or operation within defined safety limits do not fall within this definition.

Further Sources of Guidance

6. The table below lists further guidance relevant to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-008	LC8: Warning Notices
HSE Guidance on Regulations	Series Code L64	The Health and Safety (Safety Signs and Signals) Regulations 1996.

Regulation AC9 Guidance Note

Instructions to Persons on the Site and Information on Hazards

Introduction

1. The purpose of this Condition is to ensure that the Authorisee provides adequate instructions and information to all persons allowed on the Authorised site, or involved in the manufacture or handling of nuclear weapons, naval reactor plant, components, relevant support equipment or transportation, so that they are aware of the risks and hazards associated with nuclear activities, the precautions that must be taken to minimise the risks to themselves and others and the actions to be taken in the event of an accident or emergency (including emergency responders).

2. This condition is also to ensure that Authorisees with Design Authority responsibilities implement adequate arrangements to provide each Authorisee with information so that they are aware of the hazards and consequences associated with nuclear weapons, naval reactor plant, components, relevant support equipment or transportation, the associated precautions to be observed and the action to be taken in the event of an accident or emergency.

Scope

3. This guidance covers the provision of instruction to all persons who are authorised to enter a site, NPW or be involved in transportation for any purpose. The information provided to any person should be appropriate and adequate for the circumstances under which the person is authorised to be present.

4. This condition also covers the provision of information to Authorisees to enable them to assess the risk from the presence of nuclear weapons, naval reactor plant, components, relevant support equipment or transportation, the precautions to be observed and the action to be taken in the event of an accident or emergency.

Guidance to Authorisees

5. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for the provision of instructions.

b. The arrangements for authorising persons, including contractors and visitors, to be on site or NPW or involved in transportation, including the arrangements for instruction of personnel on such topics as ionising radiations, nuclear emergencies, fire and bomb/terrorist alerts and making them formally aware of the hazards and the emergency arrangements, and how such arrangements relate to non-nuclear emergency arrangements.

c. The arrangements for determining the content of the instruction provided, including an audit trail back to the hazards and emergency arrangements.

d. The arrangements for co-operation between Authorisees where their activities overlap, typically when a NPW or transportation is within the Authorised site boundary.

e. The arrangements for assessing that the outcome of instructions is acceptable.

f. The arrangements for ensuring that records of staff training are kept.

g. The arrangements for managing the interface with Authorisees with Design Authority responsibilities for the provision of information regarding the risks and hazards associated with a nuclear weapon, naval reactor plant, component or relevant support equipment, the precautions to be observed in connection therewith and the action to be taken in the event of an accident or emergency.

Additional Guidance for Authorisees with Design Authority Responsibilities

6. Consideration should be given to the following:

a. The management structure, responsibilities and interactions between associated organisations, committees and individuals.

b. The arrangements for determining, approving and maintaining up to date the information provided to other Authorisees, including an audit trail back to the source document.

c. The arrangements for transmitting information to other Authorisees.

d. Where appropriate the arrangements for assessing that other Authorisees have correctly interpreted the information.

Further Sources of Guidance

7. The table below lists further guidance relevant to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-009	LC9: Instructions to Persons on Site

Regulation AC10 Guidance Note

Training and Information on Training

Introduction

1. The purpose of this Condition is to ensure that all people who carry out activities during design, construction, manufacture, commissioning, operation or decommissioning of a nuclear installation, nuclear weapon, naval reactor plant, components or relevant support equipment which may affect safety are adequately trained for that purpose. The objective of the AC10 arrangements is to ensure that training programmes provide competent staff, able to undertake activities that contribute to nuclear safety. The Authorisee is required to ensure that the necessary training requirements are identified for each activity, that individuals who carry out these activities can demonstrate that they have received such training and are competent and that records are kept to demonstrate that individuals have been trained. Authorisees with Design Authority responsibilities are required to provide relevant information to other Authorisees where required to assist with their responsibilities. This Condition is in addition to the general duty under the Health and Safety at Work Act (HSW Act) s.2(2)(c) and the Ionising Radiation Regulations, section 15.

Scope

2. This guidance relates to the training requirements for all persons with specific safety responsibilities, including non-nuclear safety where this may have implications for nuclear or radiological safety. It is applicable to relevant organisations, whether they are regulated through the framework of Authorisation or not and includes those with emergency response responsibilities.

3. This guidance also covers the generation and transfer of information from Authorisees with Design Authority responsibilities to other Authorisees to enable them to establish their training needs.

Guidance to Authorisees

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for ensuring the provision of safety training (including safety training information) to personnel who have responsibility for any operations that may affect nuclear or radiological safety.

b. The processes and procedures employed in order to generate the information on training requirements.

c. The arrangements that ensure that a training plan is developed and maintained and equates to the training and qualifications required to undertake duties of safety specific posts.

d. The arrangements that ensure that records are kept in a training register to show that safety post holders have the required qualifications and are competent. Where personnel have more than one role, for instance their main post and also a role in responding to emergencies, then the training needs of both roles should be considered. Training records should meet the requirements of AC6.

e. The process of assessing posts' training requirements should consider the demands of any relevant safety case and the performance, skill, experience and knowledge of post holders which the safety case assumes.

f. The arrangements for ensuring a continuing programme of formal and practical training, including any new training needs and periodic refresher training.

g. The arrangements for gaining assurance that lodger units, contractors or provided external support have adequate training and arrangements for training. Authorisees should be able to provide assurance to DNSR that acceptable controls for appointing persons with the appropriate competence, qualifications and experience are in place. Where additional resources within an Authorisee's organisation are provided by contractors (for instance as secondees), then these staff should be treated as if they were employed by the Authorisee for the purposes of AC10.

h. The arrangements for:

(1) establishing the training need;

(2) approving the training solution for each safety specific post;

(3) approving the training delivery;

(4) planning and providing the training;

(5) verifying that the training is meeting the identified need.

(6) evaluating the impact of training on trainee competence.

i. The arrangements for managing the interface between Authorisees with Design Authority Responsibilities and other Authorisees for the provision of information to support

the structuring and content of training and ensure that the safety training information provided to Authorisees is up to date.

Further Sources of Guidance

5. The table below lists further guidance relevant to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-027	Training and Assuring Personnel Competence.
ONR Technical Inspection Guides	ONR NS-INSP-GD-010	LC10 - Training
IAEA Standards	NS-G-2.8	Recruitment, Qualification and Training of Personnel for Nuclear Power Plants.
	TRS-380	Nuclear Power Plant Personnel Training and its Evaluation: A Guidebook. IAEA Technical Report Series 380.
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Safety. SAPs EHF.8

Regulation AC11 Guidance Note

Emergency Arrangements

Introduction

1. The purpose of this Condition is to ensure that the Authorisee has adequate arrangements in place to respond effectively to any accident or emergency on-site (and as required by the Radiation (Emergency Preparedness and Public Information) Regulations (REPPIR19 for off-site accidents). The Authorisee is required to have arrangements in place to cover a wide range of events from minor incidents which are restricted to on-site locations to large accidents or emergencies which can result in a significant release of radioactive material to the environment. Authorisees with Design Authority responsibilities for the nuclear weapon or naval reactor plant are required to have arrangements in place to support other Authorisees and provide information should there be an accident or emergency. The Condition gives DNSR the powers to ensure that the Authorisee's emergency arrangements are exercised. DNSR uses its primary powers to ensure the Authorisee's exercises demonstrate adequate performance to protect both workers and the public.

Scope

2. This guidance relates to the arrangements for dealing with any accident or emergency which has nuclear safety implications. This includes situations where no actual hazard exists but where the potential for a hazard to arise is identified.

3. This guidance also relates to the arrangements Authorisees with Design Authority responsibilities have in place to provide information and support to other Authorisees in the event of an accident or emergency and during the render safe and recovery activities immediately following an accident or emergency.

Guidance to Authorisees

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities and structure for personnel responsible for emergency response planning.

b. The arrangements for defining and reviewing the risk and hazard assessments from which the emergency arrangements are derived, and the key conclusions of the risk and hazard assessments.

c. The arrangements for preparing the operating organisation's emergency plan on the basis of the risk and hazard assessment (as required by REPPIR 19 Schedule 6 Part 1).

d. The arrangements for ensuring that any person who has duties in relation to the emergency arrangements is a Suitably Qualified and Experienced Person, and is provided with training, instructions, equipment and other relevant resources.

e. Arrangements for ensuring that all persons on site, Nuclear Powered Warships, or involved in transportation who may be affected by the emergency are provided with the necessary instruction, training, equipment and other relevant resoures.

f. The arrangements for ensuring that any external organisations with a role in the emergency arrangements (e.g. the emergency services) are appropriately consulted and provided with all necessary information.

g. The arrangements for providing coherent information (including Consequences Report) to the local authority to enable the preparation of an off-site plan, including identification of the key aspects of the information provided.

h. The arrangements for providing advance information to the local community (as required by REPPIR 19, Schedule 8).

i. The key aspects of the emergency arrangements, including the provision of support to the off-site plan, where applicable, and in each case, the response capability or performance standard which the arrangements are intended to achieve.

j. How the emergency arrangements and any amendments thereto are approved.

k. The arrangements for ensuring compliance with the provisions of REPPIR 2019, where applicable.

l. The arrangements for managing the interface between associated Authorisees and organisations (including those with Design and Approving Authority responsibilities) for the provision of information and support in the event of an emergency.

5. In accordance with REPPIR regulation 17(1), Authorisees should notify DNSR and ONR without delay in the event of either a radiation emergency or an event which could reasonably be expected to lead to a radiation emergency.

6. DNSR will specify the parts of Authorisee AC11 arrangments for approval under AC11(2) and will expect to be provided with evidence that Authorisees have developed performance standards in accordance with JSP 471.

7. In accordance with AC11(2), Authorisees should submit to DNSR for approval such parts of their emergency arrangements as are sufficient to demonstrate compliance with AC11.

8. In accordance with AC11(5), Authorisees should rehearse their on-site emergency arrangements as the Authorisee considers necessary, or as specified by DNSR with intervals not exceeding 1 year, other than by agreement with DNSR, the scope of the rehearsal to be agreed with DNSR on a case-by-case basis.

Guidance to Authorisees further to REPPIR 2019

9. Further to REPPIR Regulations 10(5)(h), DNSR should in all cases be included in the consultations conducted by Authorisees and duty holders as appropriate for the purpose of preparing an operator's plan, in accordance with regulation 10(1), or of reviewing the plan (in accordance with Regulation 12(1)).

Additional Guidance for Authorisees with Design Authority Responsibilities

10. Consideration should be given to the following:

    a. The management responsibilities for those personnel who are responsible for ensuring the provision of emergency response information and support to Authorisees.

    b. The arrangements for the provision of suitable information and support between Authorisees in the event of an accident or emergency.

    c. The arrangements for demonstrating the adequacy of the arrangements for providing suitable information and support to Authorisees in the event of an accident or emergency.

Further Sources of Guidance

11. The table below lists further guidance relevant to this AC.

Technical Assessment Guides	DNSR TAG/D001	DNSR Guidance on Emergency Arrangements.
	ONR NS-TAST-GD-82	The Technical Assessment of REPPIR Submissions.
Technical Inspection Guides	ONR NS-INSP-GD-011	LC11 – Emergency Arrangements.
IAEA Standards	GSR Part 7	Preparedness and Response for a Nuclear or Radiological Emergency.
	GS-G-2.1	Arrangements for Preparedness for a Nuclear or Radiological Emergency.
Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Safety.
MOD JSP	JSP 471	Defence Nuclear Accident Response.
Approved Code of Practice	ONR/HSE	REPPIR 2019 Approved Code of Practice
ONR Guidance	ONR Guide	Transporting Radioactive Material – Guidance on Emergency Planning and Notification for the Transport of Class 7 Goods

Regulation AC12 Guidance Note

Duly Authorised and Other Suitably Qualified and Experienced Persons

Introduction

1. The purpose of this Condition is to ensure that only duly authorised and other suitably qualified and experienced persons perform duties which may affect safety. The Authorisee is required to ensure that all activities that can affect safety are identified and the experience and qualification requirements for people to carry out these activities are defined. The Authorisee must ensure that the qualifications and experience of people match those required for the role and that they are competent. The Condition gives DNSR the power require the removal of a duly authorised person from safety related work if they are considered unfit to perform that role.

2. The purpose of this condition is also to ensure that Authorisees with Design Authority responsibilities have adequate arrangements in place to provide information to other Authorisees to assist in the determination of the SQEP required by their personnel responsible for conducting operations with a nuclear weapon, naval reactor plant, component or relevant support equipment.

Scope

3. This guidance relates to nuclear safety and other safety posts which may have nuclear or radiological safety implications.

4. This condition also relates to SQEP within Authorisees with Design Authority responsibilities and also the provision of information to Authorisees to assist them in determining their SQEP requirements.

Guidance to Authorisees

5. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for post profiling and identification of required qualifications and experience of individuals who are to fill each nuclear safety related post.

b. A description of the system for post profiling and identification of required qualifications and experience of individuals who are to fill each nuclear safety related post.

c.The arrangements ensure that:

(1) only SQEP and competent persons carry out duties that may affect nuclear or radiological safety;

(2) only Duly Authorised Persons (DAP) are appointed to posts which provide specific control and supervision functions significantly affecting nuclear and radiation safety.

d. A description of the arrangements for appointing DAP, including the circumstances under which they hold authority, what that authority is, how that authority is transferred/relinquished, and how the DAP's authority is made known to all other personnel involved in the operation.

e. The arrangements that ensure that contractors have an appropriate level of expertise, are qualified and competent to perform the tasks required, or alternatively are supervised by Authorisee SQEP throughout their work.

f. Design and procurement activities are often carried out by external contractors who are not subject to the controls on qualifications and experience specified here. Authorisees should be able to provide assurance to DNSR that acceptable controls for appointing persons with the appropriate competence, qualifications and experience are in place in such organisations.

g. The arrangements for identifying projected SQEP requirements to undertake future work programmes and the process for ensuring that future SQEP requirements are met.

h. The arrangements for addressing identified gaps against the SQEP requirements for nuclear safety related posts, including any short term mitigation measures that may be required. The Authorisee's competence management system should ensure that foreseeable and avoidable shortages of SQEP and competence gaps are avoided.

i. The arrangements for formally waiving training requirements only where it can be demonstrated that the post holder has been assessed to the same, or an equivalent, standard and shown to be competent. Such waivers should be kept to a minimum.

j. The Authorisees arrangements for managing the interface with Authorisees with Design Authority responsibilities for the provision of information about the qualifications and experience of personnel conducting nuclear activities.

6. The Authorisee should ensure that all roles relevant to nuclear safety are appropriately described on the Nuclear Baseline.

Additional Guidance specific to Authorisees with Design Authority Responsibilities

7. Consideration should be given to the following:

a. The management structure, responsibilities and interactions between associated organisations, committees and individuals.

b. The arrangements for compiling, maintaining and approving post requirements.

c. The arrangements to ensure that only SQEP carry out duties that may affect nuclear or radiological safety.

d. The arrangements for the management of waivers.

e. The arrangements for identifying and planning for the provision of future SQEP requirements.

f. The arrangements for providing information to Authorisees to assist them in determining the qualifications and experience required by their staff.

Further Sources of Guidance

8. The table below lists further guidance relevant to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-027	Training and Assuring Personnel Competence
ONR Technical Inspection Guides	ONR NS-INSP-GD-012	LC12 – Duly authorised and other suitably qualified and experienced persons.
IAEA Standards	IAEA GSR Part 2	Leadership and Management for Safety
	IAEA NS-G-2.8	Recruitment, Qualification and Training of Personnel for Nuclear Power Plants
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities EHF.8

Regulation AC13 Guidance Note

Nuclear Safety Committee

Introduction

1. The purpose of this Condition is to ensure that the Authorisee sets up a senior level committee(s) to consider and advise on matters which affect the safe design, manufacture, construction, commissioning, operation and decommissioning of any installations on its Authorised site, nuclear weapon or naval reactor plant and any other matter relevant to safety. The committee(s) must have members who are adequately qualified and competent to perform this task including members who are independent of the Authorisee. The Condition gives DNSR the power to veto the appointment of, or continued presence of any member. The committee(s) is intended to act as a check on the Authorisee's decision making process to ensure that safety considerations are given due weight. However, the committee(s) is intended to be purely advisory and must not be considered to have an executive function. Where the Authorisee rejects the advice of the committee(s) the Condition requires the Authorisee to notify DNSR; in this way DNSR can investigate the justification of the Authorisee's safety-related actions. The committee(s) may be supported by any number of subordinate specialist committees and working groups as necessary.

Scope

2. This guidance relates to the Authorisee's Nuclear Safety Committee(s) (NSC). The responsibilities of a NSC should also cover all those aspects that are required by other Conditions and any other topic requested by the Authorisee.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The responsibilities of all personnel involved with a NSC.

b. The Terms of Reference (ToR) for any NSC, including the arrangements for providing the ToRs, and any changes to the ToRs, to DNSR for approval.

c. The constitution of any NSC, in particular the rules of attendance, what constitutes a quorum, the number of independent members, and members' experience and

qualifications. The composition of a NSC should be tailored to reflect the differing hazards present as the site, nuclear weapon or naval reactor plant progresses through its lifecycle.

d. The arrangements for managing the NSC(s), including the arrangements for making appointments to a NSC. This requires DNSR to be informed of the name, experience, qualifications and details of current and past posts held by each member.

e. The arrangements for emergency meetings or out of committee decisions of a NSC, when urgent advice is sought but a properly constituted meeting is not practicable. The arrangements should ensure that DNSR remains informed of any decisions taken in such circumstances.

f. The arrangements that ensure a record of a committee's membership, the minutes of meetings, papers and reports considered are maintained.

g. The status of NSC advice and the action to be taken if the Authorisee rejects such advice. The arrangements for notifying DNSR, as soon as practicable, if it is intended to reject, in whole or in part, any advice given by a NSC together with the reason for such rejection.

4. The arrangements should cover any subordinate committee(s) and working group(s) reporting to the NSC(s), including the overall structure, interfaces and respective ToRs, which demonstrate that robust scrutiny of nuclear safety matters is conducted at all levels and delivers demonstrably independent advice to the Authorisee.

Further Sources of Guidance

5. The table below lists further guidance relevant to this AC:

ONR Technical Inspection Guide	ONR NS-INSP-GD-013	LC13: Nuclear Safety Committee.
ONR Safety Assessment Principles	ONR SAPs. 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities MS.1-4.

Regulation AC14 Guidance Note

Safety Documentation

Introduction

1. The purpose of this Condition is to ensure that the Authorisee sets up arrangements for the preparation and assessment of the safety related documentation used to justify safety during design, manufacture, construction, commissioning, operation and decommissioning. The arrangements for the internal and external assessment of safety related documentation are intended to ensure an independent review of the scope, quality and accuracy of the Authorisee's safety related decisions and activities to ensure they have been adequately justified.

2. A further purpose of this Condition is to ensure that Authorisees with Design Authority responsibilities for the nuclear weapon or naval reactor plant have adequate arrangements for the preparation and assessment of safety information provided to other Authorisees to enable them to justify the safety of their operations.

Scope

3. This guidance applies to the arrangements for all safety documentation produced to justify the safety of the nuclear installation, nuclear weapon, naval reactor plant, components, relevant support equipment and supporting infrastructure if appropriate, through design, manufacture, construction, commissioning, operation and decommissioning, and the management of radioactive waste products including their storage and disposal. The requirement for a safety case is discussed at AC23 and associated guidance.

Guidance to Authorisees

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management structure and responsibilities of all personnel responsible for the production and approval of the safety documentation and the interactions between associated organisations, committees and individuals.

b. The arrangements to:

(1) prepare, independent peer review, assess and approve safety documentation;

(2) ensure that safety documentation is classified in accordance with its safety significance;

(3) ensure that safety documentation is produced by Suitably Qualified and Experienced Persons (SQEP);

(4) ensure that safety documentation is subject to a level of checking and review by independent SQEP that is commensurate with its safety significance, including, as appropriate, Peer Review, Independent Nuclear Safety Assessment and submission to the Authorisee's Nuclear Safety Committee(s);

(5) ensure that documentation is submitted to DNSR in accordance with the classification scheme or as specified by DNSR. This includes the provision of the Nuclear Safety Committee(s) comments and advice as appropriate;

(6) ensure that safety documentation is endorsed and approved at a level commensurate with its safety significance.

5. With regard to Authorisation Condition 14 DNSR.2:

a. The Authorisee should classify safety documentation according to safety significance.

b. DNSR agreement will be needed for activities described in safety documentation in the highest classification or as additionally specified by DNSR.

c. DNSR will be provided with any safety documentation it requests to effectively regulate the DNE.

Additional Guidance to Authorisees with Design Authority Responsibilities

6. Consideration should be given to the following:

a. The management arrangements governing the preparation, independent peer review and approval of safety documentation including arrangements within the Design Authority and between Authorisees.

b. The arrangements for transmitting safety information between Authorisees and supporting organisations.

Further Sources of Guidance

7. The table below lists further guidance relevant to this AC.

Technical Assessment Guides	ONR NS-TAST-GD-051	The Purpose Scope and Content of Safety Cases.
	DNSR TAG/D11	Safety Analyses and Safety Case Interfaces in Defence Nuclear Programmes.
ONR Technical Inspection Guides	ONR NS-INSP-GD-014	LC14: Safety Documentation.
IAEA Standards	GS-G-4.1	Format and Content of the Safety Analysis Report for Nuclear Power Plants.
	GSR Part 4	Safety Assessment for Facilities and Activities.
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition Revision 1 (January 2020)	Safety Assessment Principles for Nuclear facilities. SC.1-8,.
The Nimrod Review	HC 1025	The Nimrod Review. Charles Haddon Cave QC
UK Nuclear Safety Case Forum Guide	-	How to Write a Usable Safety Case
Nuclear Industry Safety Directors' Forum	-	The UK Nuclear Industry Guide to Peer Review of Safety Cases

Regulation AC15 Guidance Note

Periodic Review

Introduction

1. The purpose of this Condition is to ensure that the Authorisee periodically reviews the safety cases for their installations, nuclear weapons or naval reactor plant throughout their declared lifetime, to demonstrate their continued adequacy and currency. There are three types of periodic review of safety case: Periodic Safety Reviews (PSR); interim reviews; and exceptional or reactive reviews. The objective of the PSR is to determine, by means of comprehensive assessment, the extent to which the installation, nuclear weapon or naval reactor plant and associated safety case conforms to modern standards and relevant good practice, any reasonably practicable safety improvements to be implemented, and the adequacy and effectiveness of the arrangements in place to ensure safety for the period until the next PSR (to be agreed between Authorisee and DNSR as appropriate for the facility, in line with relevant good practice).

Scope

2. This guidance relates to all safety cases, safety information, safety justifications and modifications, irrespective of their safety classification.

3. The guidance also applies to Authorisees with Design Authority responsibilities, who should demonstrate through their reviews, the continued safety of the nuclear weapon, naval reactor plant, components and relevant support equipment for the period up to completion of the next review. The periodic reviews should include:

a. review of any information provided to Authorisees to justify the continued safety of their operations, and;

b. examination of all safety information and modifications, irrespective of their safety classification.

Guidance to Authorisees

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for the periodic review of safety cases.

b. The arrangements that identify, as appropriate, a tiered system of reviews of safety cases. The arrangements may typically refer to 3 types of review:

(1) The comprehensive PSR of plant, processes and systems which is carried out at regular intervals (no longer than 10-years);

(2) More frequent interim or rolling reviews to ensure the safety case remains valid reflecting any recent changes, staffing and operational arrangements remain adequate and that findings of previous reviews have been implemented;

(3) Exceptional or reactive reviews following any significant event, emergent information or change that may undermine the basis of the safety case.

c. The arrangements for reporting the review and ensuring that results of all reviews are subjected to scrutiny by a sufficiently independent and competent body before submission to the relevant Nuclear Safety Committee.

d. The arrangements for agreeing, prioritising, planning and implementing recommendations from the review. DNSR reserves the right to sample and require agreement as necessary.

e. The arrangements for reviewing the safety case if operation beyond the original justified period or equipment/system design life is considered.

f. The arrangement for determining the scope and review periodicity, linking this to its life cycle and ensuring that the safety case remains valid and is reviewed at intervals agreed by DNSR, e.g. whilst a typical timescale for periodic review is 10 years, for the naval reactor plant this may be linked to the Deep Maintenance Period programme.

g. The means by which the standards and processes for the review reflect modern standards, justifications for the adequacy of arguments are systematic, address developments in technology and safety management, consider operating experience and emergent problems, address ageing, incorporate lessons learned from other sites and industries and address the principle of continuous improvement.

h. The arrangements for ensuring that a holistic view is adopted during each review.

i. The arrangements for the provision of information between Authorisees to support their reviews.

Further Sources of Guidance

5. The table below lists further guidance relevant to this AC.

ONR Technical Assessment Guides	ONR NS-TAST-GD-050	LC15: Periodic Safety Reviews (PSRs).
ONR Technical Inspection Guides	ONR NS-INSP-GD-015	LC15: Periodic Review.
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities, SAP SC.7
IAEA Safety Standards	SSG-25	Periodic Safety Review for Nuclear Power Plants.
Nuclear Industry Safety Directors' Forum	-	The UK Nuclear Industry Guide to The Periodic Review of Leadership and Management for Safety

Regulation AC16 Guidance Note

Site Plans, Designs and Specifications

Introduction

1. The purpose of this Condition is to ensure that the Authorisee identifies, using a site plan, the Authorised site boundary and the location of all buildings, plant or areas of operations which might affect safety and maintains a schedule including details of each building, plant or area and its associated operations. This is to ensure that not only does the Authorisee understand the content and function of all safety related buildings on the site, but it also enables DNSR to gain information on the site layout to be used in emergency response and to inspect the adequacy of activities and storage conditions across the site.

2. Additionally, Authorisees with Design Authority responsibilities are required to provide DNSR with all requested design information including suitable diagrams relating to a nuclear weapon, naval reactor plant, component or relevant support equipment.

Scope

3. This guidance relates to all plans, schedules and specifications for the site, facility, NPW, transport activity, nuclear weapon, naval reactor plant, component, relevant support equipment or utilities sufficient to define the activities and boundaries.

Guidance to Authorisees

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for ensuring that site plans, design specifications and schedules are maintained up to date and are forwarded to DNSR.

b. The arrangements that ensure that site plans and schedules are updated and forwarded to DNSR prior to and following any changes on or to the Authorised site.

c. The purpose of each facility, transport activity, service or utility, their design life and the period of validity of relevant safety cases should be stated.

d. The arrangements that verify, at suitable periodicity, that the plans and schedules reflect the actual state of the subject of the plan or schedule.

e. The arrangements that ensure that independent surveys of facilities, transport activities, services or utilities are commissioned at appropriate intervals to show fitness for purpose.

f. The arrangements for ensuring that the proximity of any building does not constitute an unacceptable hazard to nuclear services.

g. The arrangements for locating facilities to ensure that hazards are minimised and separated by distance.

h. The arrangements for maintaining detailed plans of approved berths, facilities and associated services including any nuclear or explosives limitations on occupancy required by the site safety case.

i. The arrangements that state the period for which plans, designs and specifications will be retained.

Additional Guidance to Authorisees with Design Authority Responsibilities

5. Consideration should be given to the following:

a. The organisation to ensure that there is an effective management system to respond to requests from DNSR.

b. The processes and procedures governing the provision of information to DNSR, including the provision of amendments to the information already provided.

c. The processes for the provision of nuclear weapon, naval reactor plant, components or relevant support equipment designs and specifications to DNSR as specified.

Further Sources of Guidance

6. The table below lists further guidance relevant to this AC.

ONR Technical Inspection Guide	ONR NS-INSP-GD-016	LC16: Site Plans, Designs and Specifications
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities.

Regulation AC17 Guidance Note

Management Systems

Introduction

1. The purpose of this Condition is to ensure that the Authorisee establishes and implements management systems which give due priority to safety. It also requires the Authorisee to apply quality management principles to all activities which may affect safety.

2. A further purpose of this condition is to ensure that Authorisees make and implement adequate arrangements to provide assurance about the quality and safety of operations.

Scope

3. This guidance relates to the management systems used to control and monitor those actions necessary in the interest of safety and those covered by DNSR Authorisation that may affect nuclear or radiological safety. Authorisees that have responsibilities for safety should have management systems, including quality management arrangements, appropriate to the scope and extent of their activities. The management systems of Authorisees with Design Authority responsibilities should also cover monitoring of the quality of operations conducted by other Authorisees.

Guidance to Authorisees

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management structure and responsibilities of all personnel responsible for establishing, co-ordinating and maintaining the management systems, including interactions between associated organisations, committees and individuals.

b. The arrangements for ensuring that all of the management system processes (e.g. financial, commercial, project, industrial safety or environmental) give due priority to safety.

c. The arrangements for managing and supervising work with safety implications, demonstrating a clear split in responsibility for the prescription of nuclear and radiation safety and adherence to the rules.

d. The quality management arrangements, making reference to any accredited system being operated.

e. The arrangements for producing, monitoring, reviewing and maintaining documents and procedures.

f. The management arrangements for periodic internal and external assurance activities, including audits by independent competent bodies[2]. The Authorisee should demonstrate a second party assurance capability, providing adequate internal independent challenge capability[3,4].

g. The arrangements for rectification of shortfalls and deficiencies identified during audits, including the use of non-conformance monitoring, forward action plans and other arrangements to ensure that issues are not overlooked and that lessons are learned and managed.

Additional Guidance for Authorisees with Design Authority Responsibilities

5. Consideration should be given to the following:

a. The arrangements for Authorisees with Design Authority responsibilities to monitor the quality of operations conducted by other Authorisees in order to support continued approval for service use.

[2] First party audits by the Operator; Second party audits by the Internal Oversight function and third party audit undertaken by an independent body outside the Authorisee or Operator.
[3] As required by DSA01.2 Chapter 2 "*TLB Holders, CEOs and SDHs to establish internal governance arrangements to ensure and assure compliance with safety policy & Regulation and to monitor & manage performance and resolution of enforcement action*".
[4] See also DNSR TAG on Internal Oversight (in preparation)

Further Sources of Guidance

6. The table below lists further guidance relevant to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-017	LC17 - Management Systems.
ONR Technical Assessment Guides	ONR NS-TAST-GD-080	Challenge Culture, Independent Challenge Capability (including an Internal Regulation function) and the Provision of Nuclear Safety Advice.
ONR Technical Assessment Guides	ONR NS-TAST-GD-077	Supply Chain Management Arrangements for the Procurement of Nuclear Safety Related Items or Services.
IAEA Standards	GSR Part 2	Leadership and Management for Safety
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	ONR Safety Assessment Principles for Nuclear Safety SAPs MS.1-4.
ISO Standard	ISO 9001: 2015	Quality Management Systems – Requirements.
Nuclear Industry Safety Directors' Forum	Issue 1, January 2014	The UK Nuclear Industry Good Practice Guide to Independent Oversight.

Regulation AC18 Guidance Note

Radiological Protection

Introduction

1. The purpose of this Condition is to ensure that the Authorisee makes and implements adequate arrangements to assess the average effective dose for such class or classes of persons as the Authorisee may specify. It also requires the Authorisee to notify DNSR if the dose exceeds such levels as DNSR may specify. This is complementary to the Ionising Radiations Regulations 2017, reg. 26.

Scope

2. This guidance relates to the arrangements for assessing the average effective dose for classes of persons identified by the Authorisee.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for radiological protection including personal dosimetry and for the assessment of dosimetry returns.

b. The classes of persons for whom the average effective dose will be assessed.

c. The arrangements for assessing, recording and retaining the average effective dose of classes of persons.

d. The arrangements for identifying and notifying DNSR if the average effective dose exceeds levels specified by DNSR.

Further Sources of Guidance

4. The table below lists further guidance relevant to this AC**:**

ONR Technical Inspection Guides	ONR NS-INSP-GD-018	LC18 – Radiological Protection.
ONR Technical Assessment Guides	ONR NS-TAST-GD-038	Radiological Protection
	ONR NS-TAST-GD-043	Radiological Analysis Normal Operation
	ONR NS-TAST-GD-045	Radiological Analysis Fault Conditions
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities SAP RP.1-6
UK Government Legislation	IRR-17	The Ionising Radiation Regulations 2017 Approved Code of Practice

Regulation AC19 Guidance Note

Construction or Installation of New Plant

Introduction

1. The purpose of this Condition is to ensure that the Authorisee exercises adequate control over the construction and installation of new plant which may affect safety. The objective is for the Authorisee to plan and safely manage the construction of any safety related plant. This is to ensure that before construction takes place a pre-construction safety report is produced to demonstrate the safety of the installation and construction activities. The Condition gives DNSR the power to prevent the commencement of construction until it is satisfied with the safety justification and/or place hold points during the construction process to ensure the installation is being constructed in accordance with the stated intent and that step changes in risk are appropriately managed. DNSR's control can be either through using primary powers in the Condition or through derived powers built into the Authorisee's arrangements. Design of nuclear weapons or naval reactor plant is covered under FAC5, but it is important that the Authorisee with Design Authority Responsibilities specifies and provides the necessary design information to other Authorisees who will be responsible for construction or manufacture prior to the start of construction or manufacture.

Scope

2. This guidance relates to the control of manufacture, construction or installation of any new facility supporting the Defence Nuclear Enterprise, nuclear weapon, naval reactor plant, component or relevant support equipment.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel involved in manufacture, construction, assembly and installation activities, including those responsible for classifying, justifying, controlling and supervising the proposed work.

b. The arrangements to ensure that documentation to justify the safety of the undertakings is produced and assessed in accordance with the Authorisee's arrangements for AC14.

c. The arrangements to ensure that lessons learned from other similar projects are identified and applied.

d. The arrangements for managing the work during all phases of manufacture, construction or installation, including the assessment of hazards specific to the work and interactions with the broader site. This should demonstrate an integrated approach.

e. The arrangements for the production of a project programme and management plan that includes the arrangements for dividing the work into stages, where appropriate, each of which will have a safety justification and require the consent of DNSR, where so specified, before commencement. Hold points and the associated activities should be identified for internal approval activities (typically, internal assurance, Independent Peer Review, Nuclear Safety Committee and the Design Authorities), as well as those associated with external assessment activities undertaken by DNSR. The criteria and deliverables required for release of hold points should be clearly specified and agreed with the consenting body (or bodies) in advance. Hold point release criteria should address the requirements of all Authorisation Conditions relevant to the activity being permissioned.

f. The arrangements for managing interactions with DNSR.

Additional Guidance for Authorisees with Design Authority Responsibilities

4. Consideration should be given to the following:

a. the arrangements for specifying to manufacture and build organisations, the safety requirements to be satisfied by the facility, nuclear weapon, naval reactor plant, component or relevant support equipment;

b. the system to develop, agree and modify the programme of safety related work;

c. the arrangements associated with establishing and proving the manufacturing capability, and for appropriate oversight to ensure that the quality and build standards are maintained in accordance with the design intent;

d. the arrangements for ensuring the adequacy of the evidence generated, including aspects such as the management of trials, modelling and assessments, documentation and build standard reconciliation;

e. the arrangements governing the safety assessment of the evidence generated;

f. the arrangements for developing facility, plant, component or relevant support equipment processes and procedures (e.g. Standard Operating Procedures) used post manufacture.

Further Sources of Guidance

5. The table below lists further guidance relevant to this AC**:**

ONR Technical Assessment Guides	ONR NS-TAST-GD-051	The Purpose, Scope and Content of Nuclear Safety Cases
	ONR NS-TAST-GD-057	Design Safety Assurance.
	ONR NS-TAST-GD-076	Construction Assurance.
ONR Technical Inspection Guides	ONR NS-TAST-GD-077	Supply Chain Management Arrangements for the Procurement of Nuclear Safety Related Items or Services
IAEA Safety Standards	ONR NS-INSP-GD-019	LC19: Construction or Installation of New Plant.
	GS-G-3.5	The Management System for Nuclear Installations, 2009
ONR Safety Assessment Principles	SSR-2/1	Safety of Nuclear Power Plants: Design
	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities EDR.1-4

Regulation AC20 Guidance Note

Modification to Design of Plant Under Construction

Introduction

1. The purpose of this Condition is to ensure that the Authorisee does not modify the design of an installation, nuclear weapon, naval reactor plant, component or relevant support equipment during construction without going through a proper design change process which assesses the modification in relation to its safety significance, reflecting the modification in a commensurate safety case. The Condition gives DNSR the power to prevent a modification from commencing if it believes there is an inadequate safety case for the design change and its implementation. It also requires the Authorisee to divide modifications, where appropriate, into stages and to not commence or progress from one stage to the next without the consent of DNSR, where specified.

Scope

2. This guidance relates to all modifications during manufacture, construction and installation of any installation, nuclear weapon, naval reactor plant, component or relevant support equipment.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel who are responsible for ensuring that design modifications during construction are managed, controlled and supervised.

b. The arrangements for classifying or re-classifying modifications according to their safety significance; the management arrangements governing the processing and approval of modifications at each classification level.

c. The arrangements for implementing the modification in stages, where appropriate, with each stage needing DNSR consent before commencement, if specified.

d. The safety documentation justifying the safety of the modification and its impact on the overall safety case, describing the level of approval required commensurate with its classification.

e. A hold point strategy, aligned, where appropriate, with hold points defined under AC19, and the arrangements for defining the appropriate level of approval for each stage.

f. The arrangements for appointing a committee, whose specific purpose is to approve safety related design changes.

g. The role of relevant groups or review bodies, including Authorisees with Design Authority responsibilities and the involvement of the Nuclear Safety Committee if the modification is deemed to be of significant classification.

h. The arrangements for approval of modifications.

i. The arrangements in place for producing and keeping records. Records are considered under AC6.

Additional Guidance for Authorisees with Design Authority Responsibilities

4. Consideration should be given to the following:

a. the arrangements for specification of the modified design intent to the manufacture and build organisations responsible for implementing it;

b. the arrangements for coordination with site Authorisees to ensure that implementation of modifications can be justified;

c. the arrangements for confirming the adequacy of quality and build evidence to demonstrate embodiment of the modified design intent.

Further Sources of Guidance

5. The table below lists further guidance relevant to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-051	The Purpose, Scope and Content of Nuclear Safety Cases
ONR Technical Inspection Guides	ONR NS-INSP-GD-020	LC20: Modification to Design of Plant under Construction.
IAEA Safety Standards	NS-G-2.3	Modifications to Nuclear Power Plants, 2001.
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities For instance, SC.7

Regulation AC21 Guidance Note

Commissioning

Introduction

1. Prior to operation of any new or modified installation, nuclear weapon, naval reactor plant, component, relevant support equipment or process, or those that have undergone considerable maintenance activities, it is important to commission the various systems to demonstrate they function as intended before the system goes into routine operation. The purpose of this Condition therefore, is to ensure that the Authorisee has adequate arrangements for the commissioning of a new, modified or post-outage installation, nuclear weapon, naval reactor plant, component, relevant support equipment or process which may affect safety. The Condition gives DNSR powers to control various stages of commissioning. This is to ensure that the Authorisee demonstrates that construction or manufacture has been completed according to the design intent, and the necessary safety implications associated with commissioning have been considered and assessed and shown to be acceptable.

Scope

2. This guidance relates to all commissioning of any new, modified or post-outage installation, nuclear weapon, naval reactor plant, component, relevant support equipment or process which may affect safety. The arrangements also apply after major work to restore the design intent, including deep maintenance periods, or after such events as a fire when major repair work may be required.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel who are responsible for ensuring that commissioning trials are carried out safely.

b. The system to define the commissioning required for each new, modified or post-outage item. This should clearly differentiate between the testing required to demonstrate the project's design intent and the overall commissioning required to demonstrate correct functioning and fitness for purpose of plant, people and processes.

c. The arrangements for dividing commissioning into stages, including inactive and active commissioning, where appropriate, recognising that each stage may require DNSR consent, if specified, before starting the next stage.

d. The arrangements that ensure only competent and Suitably Qualified and Experienced Persons control the commissioning process and assess the results of any tests or trials.

e. The safety documentation justifying the safety of the proposed commissioning and the description of the level of approval required, including the approval of concessions. For new plant DNSR will expect all pre-commissioning safety reports to be approved before any inactive and active commissioning takes place.

f. The arrangements that ensure there are comprehensive and accurate records of test and trial results kept under configuration control and that assessment of the results are kept and form part of the commissioning report.

g. The arrangements that ensure that new, modified or post-outage items which may affect safety are not operated until the appropriate stage of commissioning has been completed, a report of such commissioning has been produced and a safety case(s) has been developed, approved and implemented.

h. The Authorisee should make provision for the relevant Design Authorities to be integrated into the arrangements for commissioning where necessary and should be able to demonstrate that the design intent is maintained throughout all stages of design, build and commissioning. DNSR will seek assurance that the integrity of the design intent and appropriate configuration control is being maintained. The management of these aspects is normally vested in a committee (i.e. a Test Group or Authorisation Group) which incorporates both the site Authorisee's and Design Authority's requirements. Inactive and active commissioning should be planned and executed to show that the design assumptions have been met.

i. All work with nuclear safety significance should be carried out in accordance with an appropriate procedure. The procedure should undergo a process of review and approval commensurate with its significance to safety.

Additional Guidance for Authorisees with Design Authority Responsibilities

4. Consideration should be given to the following:

a. The management structure, responsibilities and interactions between associated organisations, committees and individuals.

b. The processes and procedures governing the management and approval of commissioning activities, including but not limited to:

(1) the identification and recording of the objectives of the commissioning programme;

(2) the arrangements with any Authorisee to develop, record, agree and, where necessary, modify the commissioning programme;

(3) the arrangements for dividing commissioning into stages, and the safety documentation required;

(4) The arrangements to demonstrate that design intent has been maintained during the commissioning process;

(5) the arrangements for demonstrating the adequacy of the 'in-service' processes and procedures (e.g. Ship's Operating Procedures, Procedural Guides and Special Weapon Operating Publications);

(6) the arrangements governing the assessment of the commissioning evidence;

(7) the procedures used to identify and retain records of the commissioning process; and

(8) the arrangements for maintaining the validity of the commissioning evidence generated.

c. The arrangements for managing interactions with the Defence Nuclear Safety Regulator.

Further Sources of Guidance

5. The table below lists further guidance relevant to this AC**:**

ONR Technical Assessment Guides	ONR NS-TAST-GD-028	Control and Instrumentation aspects of Commissioning.
ONR Technical Inspection Guides	ONR NS-INSP-GD-021	LC21: Commissioning.
IAEA Safety Standards	GS-G-3.5	Management System for Nuclear Installations
	SSR 2/2	Safety of Nuclear Power Plants: Commissioning and Operation
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities SAP ECM.1.
DNSR Technical Assessment Guide	TAG/D014	Commissioning (NNPP)

Regulation AC22 Guidance Note

Modification or Experiment on Existing Plant, Nuclear Weapon, Naval Reactor Plant, Components or Relevant Support Equipment

Introduction

1. Many accidents across all industries have been caused by modifications to operating plant or changes to processes that were ill-conceived or poorly executed. The purpose of this Condition is to ensure that the Authorisee has adequate arrangements to assess and control all modifications (as defined by AC1, both temporary and permanent) or experiments that may affect safety. The Condition also gives DNSR the power to control such modifications to ensure that they cannot commence until the Authorisee has adequately demonstrated the safety of the proposal; DNSR may employ primary powers or derived powers via the Authorisee's own arrangements. The Condition also gives DNSR the power to direct the Authorisee to halt a modification or intervene at any stage in the interest of safety.

Scope

2. This guidance relates to all modifications, trials or experiments carried out on any part of an existing facility, nuclear weapon, naval reactor plant, component, relevant support equipment or process that may affect safety.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel who are responsible for ensuring that modifications, trials or experiments are managed, controlled and supervised.

b. The arrangements for classifying modifications, trials and experiments according to their safety significance; the management arrangements governing the processing and approval of modifications, trials and experiments at each classification level; and the safety documentation required for each classification level.

c. The arrangements for considering the effect of modifications on the classification of the facility, component or relevant support equipment.

d. The arrangements for ensuring that the procedures for modifications, trials or experiments are properly implemented, controlled, authorised and conducted.

e. The arrangements for implementing the modification, trial or experiment in stages, where appropriate, with each stage requiring DNSR consent before commencement, if specified.

f. Producing a hold point strategy, where appropriate, and the arrangements for defining the appropriate level of approval for each stage.

g. The safety documentation justifying the safety of the modification, trial or experiment and the level of approval required.

h. The role of relevant groups or review bodies, including the involvement of the Nuclear Safety Committee and Authorisees with Design Authority responsibilities.

i. The Authorisee's arrangements should make provision for Authorisees with Design Authority responsibilities to be integrated into the control of modifications and alterations ensuring that operating instructions and procedures are consistent with the safety case and the design intent.

j. The arrangements, if so directed by DNSR, to halt a modification and not to recommence without the consent of DNSR.

Additional Guidance for Authorisees with Design Authority Responsibilities

4. Consideration should be given to the following:

a. The management structure, responsibilities and interactions between associated organisations, committees and individuals.

b. The processes and procedures undertaken to classify modifications according to safety significance, assess, approve and implement changes to the design of a nuclear weapon, naval reactor plant, component or relevant support equipment. This should include the:

(1) processes and procedures employed to initiate modification action when arising from within Design Authority or externally, typically manufacturing concessions and changes to logistics;

(2) processes and procedures undertaken to assess a proposed modification;

(3) arrangements for the review and approval of a modification;

(4) arrangements for provision of information and support to Authorisees responsible for implementing a modification;

(5) arrangements for gaining assurance that a modification has been implemented correctly in accordance with the design intent;

(6) arrangements for governing the dissemination of information following a modification;

(7) safety classification system employed; and

(8) processes and procedures used to update the design and as built records, manufacturing records and documentation defining the interfaces.

c. The principal interactions with the Defence Nuclear Safety Regulator.

Further Sources of Guidance

5. The table below lists further guidance relevant to this AC**:**

ONR Technical Inspection Guides	ONR NS-INSP-GD-022	LC22: Modification or Experiment on Existing Plant.
IAEA Safety Standards	NS-G-2.3	Modifications to Nuclear Power Plants
IAEA International Nuclear Safety Advisory Group	INSAG-19	Maintaining the Design Integrity of Nuclear Installations throughout their Operating Life
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities SAP SC.1-8
The Nimrod Review	HC1025	The Nimrod Review. Charles Haddon Cave QC

Regulation AC23 Guidance Note

Operating Rules

Introduction

1. The safety of a nuclear activity results from many factors including the design of the facilities and equipment, their behaviour under fault or accident conditions and the functions of the operators. It is therefore essential that the totality of these often complex interactions are fully understood. The purpose of this Condition is to ensure that the Authorisee produces a safety case to justify the safety of the activity, and that the safety case identifies all the necessary conditions and limits of safe operation, i.e. operating rules. Operating rules must be set to ensure that operations are kept within parameters which ensure safety during normal operation and in fault and accident conditions, and allowing appropriate margins of safety.

2. A further purpose of this Condition is to ensure that Authorisees with Design Authority Responsibilities produce a safety case that identifies for other Authorisees all the necessary operating rules that ensure that the nuclear weapon, naval reactor plant, components or relevant support equipment is kept within parameters which ensure safety during normal operation and in fault and accident conditions. This includes the limits and conditions that are necessary during storage, handling, maintenance, transport or other activities to ensure the safety of the nuclear weapon, naval reactor plant, component or relevant support equipment through life.

Scope

3. This guidance relates to the production of safety cases to identify operating conditions and limits necessary in the interest of safety, hereinafter referred to as operating rules. Operating rules include the limits of the normal safe operating envelope, and any other limits or conditions needed for safety.

Guidance to Authorisees

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

   a. The identification of the safe operating envelope of the installation, nuclear weapon, naval reactor plant, components, relevant support equipment, transport or other nuclear related activity.

b. The identification in the safety case of appropriate operating rules to be applied by the operator which will keep the operation within safe limits allowing an appropriate margin.

c. The arrangements that ensure that any operating rules identified in safety cases have been effectively translated into operational documentation.

d. The management responsibilities of all personnel who are responsible for defining, approving, producing, reviewing and maintaining the operating rules, ensuring a consistent and rigorous link to the design substantiation and safety case.

e. The arrangements for dealing with breaches of operating rules, including the arrangements for event reporting (AC7) and the recording and monitoring of breaches to feed into a review process by competent persons.

f. The linkages with related ACs, e.g. AC 14, 24, along with any other links necessary to ensure that the Authorisee's safety management arrangements are effective and consistently implemented.

g. The arrangements for ensuring that the appropriate operating rules are derived, reviewed, maintained and approved, including consideration by the relevant Nuclear Safety Committee, and/or DNSR approval, if specified.

h. The arrangements for ensuring any amendment to operating rules is subject to an appropriate Authorisee due process, including Design Authority approval where appropriate.

i. The arrangements for ensuring the DNSR approval of amendments to operating rules previously approved by DNSR, before implementation.

j. The arrangements for demonstrating compliance with operating rules, including the production and keeping of relevant operational records.

k. The arrangements for monitoring interfaces with the Design Authority supporting the Authorisee in the identification of operating rules to ensure that design intent is maintained.

5. AC23 requires the production of an adequate safety case to demonstrate the safety of an operation. A safety case will not be deemed adequate unless it demonstrates that risks arising from the operation are reduced ALARP (the requirement to reduce risks ALARP is stated in DSA 1.1). DNSR may withhold permission to undertake an operation if the safety case does not demonstrate that risks from that operation are reduced ALARP.

Additional Guidance for Authorisees with Design Authority Responsibilities

6. Consideration should be given to the following:

a. The management structure, responsibilities and interactions between associated organisations, committees and individuals.

b. The arrangements controlling interactions with other Authorisees, including the arrangements for transmitting information.

c. The arrangements for managing interactions with DNSR.

d. The arrangements employed by Authorisees with Design Authority Responsibilities for reviewing, approving and maintaining up-to-date operating rules to ensure that design intent is maintained.

Further Sources of Guidance

7. The table below lists further guidance relevant to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-035	Limits and Conditions for Nuclear Safety (Operating Rules).
	ONR NS-TAST-GD-003	Safety Systems.
ONR Technical Inspection Guides	ONR NS-INSP-GD-023	LC23: Operating Rules.
IAEA Safety Standards	NS-G-2.2	Operating Limits and Conditions and Operating Procedures for Nuclear Power Plant.
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities

Regulation AC24 Guidance Note

Operating Instructions

Introduction

1. The safety of a nuclear installation, nuclear weapon, naval reactor plant or nuclear activity is influenced by the actions of people who control, maintain or service the facilities and equipment. It is important given the often complex nature of the safety case for all actions carried out by people to be done in accordance with procedures derived from the safety case and design intent. It is also important that actions are not carried out on an ad hoc basis. Therefore the purpose of this Condition is to ensure that all operations as defined in Condition 1 which may affect safety (including any instructions or information required to implement operating rules), are undertaken in accordance with written operating instructions.

Scope

2. This guidance relates to operations that may affect nuclear or radiological safety. However, these can often not be separated in operating instructions from other operations which ensure the satisfactory output from the facility or activity; such operations include the routine day-to-day operations and related activities such as research, trials, maintenance, commissioning and decommissioning.

3. This guidance also relates to the provision of information from Authorisees with Design Authority responsibilities for the “in-service” written operating instructions that govern the through life safety of nuclear weapons, naval reactor plant, components and relevant support equipment.

Guidance to Authorisees

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for implementing (writing and acting upon) written operating instructions.

b. The arrangements for translating the operating rules into operating instructions. Such operating instructions should include:

(1) step-by-step instructions on how to carry out an operation to ensure that it is undertaken in a manner consistent with the design intent and the safety case;

(2) instructions to ensure that the operating rules are complied with (operating rules may be cited explicitly);

(3) other instructions necessary in the interests of safety.

c. The arrangements for ensuring that the operating instructions and operating rules are made available to personnel as appropriate.

d. The arrangements for introducing operating instructions, their review, amendment, control and approval, and the furnishing of operating instructions to DNSR, if specified.

e. The arrangements for initiating a review of operating instructions in the light of operational experience indicating, for example, difficulties in following or understanding them. See also guidance to Authorisation Condition 23 on breach of operating rules.

f. The arrangements for ensuring that when significant changes are made to operating instructions they are submitted to an appropriate internal safety authority for approval, and furnished to DNSR, if specified.

g. The arrangements for managing the interface with Authorisees with Design Authority responsibilities, for the provision of information to enable Authorisees to provide operating instructions including any instructions necessary in the interests of safety and any instructions necessary to ensure that any operating rules are implemented.

h. The arrangements in place for producing and keeping records. Records are considered under AC6.

Additional Guidance for Authorisees with Design Authority Responsibilities

5. Consideration should be given to the following:

a. The management structure, responsibilities and interactions between associated organisations, committees and individuals.

b. The processes and procedures undertaken to ensure that adequate safety instructions are generated, including the arrangements for reviewing, amending, controlling, approving and maintaining up-to-date such instructions.

c. The arrangements for controlling interactions between Authorisees, including the arrangements for providing Authorisees with “instructions necessary in the interest of safety” and the conditions and limits of safe operation.

d. The arrangements for managing interactions with the Defence Nuclear Safety Regulator.

Further Sources of Guidance

6. The table below lists further guidance relevant to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-024	LC 24: Operating Instructions,
IAEA Standards & Guides	IAEA NS-G-2.2	Operational limits and conditions and operating procedures for nuclear power plants
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Safety. SC.4-6

Regulation AC25 Guidance Note

Operational Records

Introduction

1. The purpose of this Condition is to ensure that adequate records are kept regarding operation, inspection and maintenance of any installation, nuclear weapon, naval reactor plant, component or relevant support equipment.

2. The purpose of this Condition is also to ensure that Authorisees with Design Authority responsibilities have arrangements for specifying to Authorisees the records to be made of the operations conducted in facility, with nuclear weapons, naval reactor plant, components, relevant support equipment or High Activity Sealed Sources (HASS) to support continued Approval for use.

Scope

3. Operational records are those including, but not limited to, examination, inspection, maintenance and testing of any installation, nuclear weapon, naval reactor plant, safety-related plant component, relevant support equipment or HASS which may affect safety and records of the amount and location of all radioactive material, including nuclear fuel and radioactive waste, used, processed, stored or accumulated on site or nuclear powered warship at any time.

Guidance to Authorisees

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. Management responsibilities of all personnel responsible for records associated with the through life safety of any installation, nuclear weapon, naval reactor plant, component or relevant support equipment which may affect safety.

b. The arrangements for identifying the records to be kept and the retention period. The arrangements for ensuring that records of operations are produced, controlled and retained. Operational records should, where appropriate, include the results of the operation, inspection and maintenance, and the environmental exposure levels experienced.

c. The arrangements for ensuring that baseline records are established and re-established following modifications or changes in operations.

d. The arrangements for the recording and keeping of records of the amount and location of all radioactive material, including waste stored or accumulated on sites and nuclear powered warships.

e. The arrangements for security of records, including duplication and diversity of storage to minimise the risk of accidental destruction.

f. The arrangements for managing the interface with Authorisees with Design Authority responsibilities to establish what records are to be made of the activities conducted with or on nuclear weapons, naval reactor plant, components or relevant support equipment as necessary to support approval for service use.

g. The arrangements for operational records that permit the Authorisee to review previous operations so as to:

(1) establish a safety baseline for a plant, facility or Nuclear Weapon System;

(2) confirm the nuclear weapon, naval reactor plant, component or relevant support equipment design intent is maintained through life and during decommissioning;

(3) confirm the continuing validity of the safety case;

(4) establish that assumptions regarding operations made in the safety case are realistic;

(5) support justification of continued operation in the case of abnormal/anomalous events, defects etc.;

(6) allow analysis to support improvements in design or operation in support of Authorisation Condition 14 (AC14);

(7) support the berth assessment process, FAC2;

h. A systematic approach should be taken to identify what records should be kept and reasons for retaining each record. This should include such items as operating logs, records of maintenance activities, records of specific trials (which may be covered by Test Forms or Nuclear Procedures), etc.

i. The arrangements should ensure that the records are maintained so as to meet the requirements of AC6 for security, access and means of retrieval. The coherence of the arrangements with those of other Authorisees is an important factor, where applicable.

j. DNSR will specify that Authorisees should provide DNSR with records of high activity sealed sources as defined in the High-Activity Sealed Radioactive Sources and Orphan Sources Regulations and referenced in the Environmental Permitting (England and Wales) Regulations (Schedule 23, Part 5). HASS are treated separately in Scotland in the Environmental Authorisations (Scotland) Regulations, HASS having been revoked in Scotland. This applies to HASS which are held on the Authorised site, and which are not already held under a notification granted by Environment Agency/Scottish Environment Protection Agency.

k. MOD has determined that the following radioactive material does not constitute High-Activity Sealed Sources and should not be included in notifications:

(1) any component of a nuclear weapon;

(2) any nuclear fuel element;

(3) any radioactive substance inside a nuclear reactor;

(4) containers of radioactive material where the radioactive material would not constitute a sealed source in the absence of the container, and the container is for the purpose of storage or transport rather than to ensure the integrity of the source as in ISO 2919.

Additional Guidance for Authorisees with Design Authority Responsibilities

5. Consideration should be given to the following:

a. The management structure, responsibilities and interactions between the associated organisations, committees and individuals.

b. The processes and procedures undertaken in order to define and agree the nuclear weapon, naval reactor plant, component or relevant support equipment operational records required.

c. The arrangements for specifying to Authorisees the operational records to be compiled.

d. The arrangements for managing interactions with the Defence Nuclear Safety Regulator.

Further Sources of Guidance

6. The table below lists further guidance related to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-025	LC25: Operational Records.
IAEA Standards & Guides	GSG-13	Functions and Processes of the Regulatory Body for Safety
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities SAP MS.2

Regulation AC26 Guidance Note

Control and Supervision of Operations

Introduction

1. The purpose of this Condition is to ensure that safety-related operations are carried out only under the control and supervision of competent and suitably qualified and experienced personnel (SQEP).

Scope

2. This guidance relates to all operations that may affect nuclear or radiological safety.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for ensuring that no operations are carried out that may affect nuclear or radiological safety except under the control and supervision of SQEP who have been appointed for that purpose.

b. The arrangements for ensuring that all safety significant tasks undertaken on the Authorised site, including those undertaken by personnel who are not part of the site Authorisee's organisation, are controlled and supervised by SQEP who have been appointed for that purpose by the Authorisee.

c. The arrangements for ensuring that copies of the operating instructions and operating rules are made available to operating personnel.

d. The links to related Authorisation Conditions, including AC10, 12, 17, 28 and 36.

Further Sources of Guidance

4. The table below lists further guidance related to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-026	LC26: Control and Supervision of Operations.
IAEA Standards	GS-G-3.1	Application of the Management System for Facilities and Activities
IAEA Standards	NS-G-2.4	The Operating Organization for Nuclear Power Plants
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities EHF.1-12

Regulation AC27 Guidance Note

Safety Mechanisms, Devices and Circuits

Introduction

1. Nuclear facilities, nuclear weapons, naval reactor plant and equipment are designed to have multiple safety systems to provide defence in depth against mal-operation, faults or accidents. It is important that at all times there are sufficient of these systems in good working order because by definition they must be able to function on demand and such instances are unpredictable. The purpose of this Condition is therefore, to ensure that there are always sufficient and operable safety mechanisms, devices and circuits (SMDC) to provide the necessary defence in depth.

2. The purpose of this condition is also to ensure that Authorisees with Design Authority responsibilities have arrangements to specify to other Authorisees which conditions and limits for nuclear weapons, naval reactor plant, components and relevant support equipment require the provision of SMDCs.

Scope

3. This guidance relates to SMDCs identified in the safety case.

4. This guidance also covers the Authorisees with Design Authority responsibilities' arrangements to identify to other Authorisees where SMDCs need to be embodied into their equipment. Such circumstances may arise where, under fault or accident conditions, the Authorisee's equipment has the potential to give rise to an adverse environment sufficient to overwhelm the protection built in to the nuclear weapons, naval reactor plant, components and relevant support equipment.

Guidance to Authorisees

5. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for ensuring there are adequate SMDCs connected and operational for the activity being conducted.

b. The arrangements for ensuring appropriate SMDCs for any operation are identified by the safety case as necessary. The requirement for SMDCs to be connected (where

not permanently installed) and their set points, such as trip or alarm levels, should be designated in the safety case as operating rules (see also AC23).

c. The arrangements for ensuring that the required SMDCs and set points for a particular activity are incorporated into operating documentation and approved via the appropriate clearance route (see also AC24).

d. The arrangements for ensuring SMDCs are kept in good working order through regular and systematic examination, inspection, maintenance and testing (see also AC28).

e. The actions to be taken following the operation of those SMDCs essential for ensuring safety.

f. The arrangements for reporting any failure to comply with the safety case requirements for SMDCs, or any failure of a SMDC discovered for instance during testing, as an incident under AC7 arrangements. Similarly, should a demand be placed on any SMDC for any reason, the circumstances should also be reported as an incident.

g. The arrangements for managing the interface with Authorisees with Design Authority responsibilities to establish which operating conditions and limits should be governed by the provision of suitable and sufficient SMDCs and who will provide information in respect of such SMDCs.

Additional Guidance for Authorisees with Design Authority Responsibilities

6. Consideration should be given to the following:

a. The management structure, responsibilities and interactions between the associated organisations, committees and individuals responsible for defining the requirements for SMDCs.

b. The processes and procedures governing the:

(1) identification of those operating rules that require the introduction of SMDCs by an Authorisee; and

(2) reassessment of the requirements following a change, typically in the operating rules.

c. The arrangements controlling interactions with Authorisees.

Further Sources of Guidance

7. The table below lists further guidance related to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-003	Safety Systems.
	ONR NS-TAST-GD-010	Early Initiation of Safety Systems.
ONR Technical Inspection Guides	ONR NS-INSP-GD-027	LC27: Safety Mechanisms, Devices and Circuits,
IAEA Standards	SSG-39	Design of Instrumentation and Control Systems for Nuclear Power Plants
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities ESS.1-27
NWR Safety Principles	DSA03–DNSR, Issue 1	This Document , Annex J

Regulation AC28 Guidance Note

Examination, Inspection, Maintenance and Testing

Introduction

1. Nuclear installations, nuclear weapons, naval reactor plant, components and relevant support equipment require maintenance and if such maintenance is not carried out properly it has the potential to undermine the safety case and put safety at risk. The purpose of this Condition therefore, is to ensure that all structures, systems and components that may affect safety are scheduled to receive regular and systematic examination, inspection, maintenance and testing, by and under the control of suitably qualified and experienced personnel and that records of examination, inspection, maintenance and testing activities are kept. The condition also requires Authorisees with Design Authority responsibilities to adequately specify the systematic examination, inspection, maintenance and testing to be conducted by other Authorisees.

Scope

2. This guidance relates to the correct and regular conduct of Examination, Inspection, Maintenance and Test (EIMT) of all structures, systems and components that may affect safety and the provision of an EIMT schedule.

3. This guidance also relates to the specification by Authorisees with Design Authority responsibilities of in-service EIMT requirements to be implemented by Authorisees.

Guidance to Authorisees

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for:

(1) producing and controlling the EIMT schedules for all nuclear safety related equipment in accordance with the requirements of the safety justification;

(2) ensuring that all nuclear safety related equipment is examined, inspected, maintained and tested and is in a safe condition to enable approved operations to be undertaken;

(3) ensuring that only competent Suitably Qualified and Experienced Persons carry out the EIMT activities, including supervision of the task;

(4) ensuring that when any EIMT reveals that safe operation or safe condition may be affected the appropriate action is taken to ensure that the matter is investigated and reported in accordance with the arrangements made under Authorisation Condition 7 (AC7).

b. The arrangements for producing EIMT Schedules, including how they are derived from the safety cases, describing the operations and the periodicity of EIMT.

c. The arrangements for ensuring that EIMT schedules are carried out on time (unless DNSR Approved the arrangements and agreed to an extension of the interval specified in the EIMT schedule). It is therefore in the interests of the Authorisee to:

(1) identify the limiting safe periodicity for EIMT items;

(2) identify a periodicity for EIMT, within the limit defined above, which will give flexibility to suit operational needs.

d. The arrangements for operating and reviewing the schedule, including recording of results (as required by AC25) and ensuring that those personnel carrying out the work are competent and have the appropriate qualifications and experience.

e. AC30, Periodic Shutdown, requires EIMT schedules to be adhered to, even if shutdown is necessary to carry out EIMT.

f. The arrangements for:

(1) allowing the suspension or delay in carrying out particular EIMT, specifying the levels at which such suspensions or delays are authorised.

(2) ensuring that appropriate action is taken in the event of a failure during EIMT and the requirements for reporting in such circumstances.

(3) managing interfaces between EIMT schedules of different Authorisees.

g. The arrangements for submitting any specified part or parts of EIMT schedules to DNSR for approval, and for not altering or amending any approved part of an EIMT schedule without the approval of DNSR.

h. The arrangements for managing the interface with Authorisees with Design Authority responsibilities to establish the EIMT requirements and remain informed of any changes.

Additional Guidance for Authorisees with Design Authority Responsibilities

5. Consideration should be given to the following:

a. The management structure, responsibilities and interactions between the associated organisations, committees and individuals.

b. The arrangements for deriving and approving the EIMT policy, including how they are derived from safety analysis.

c. The processes and procedures governing the determination of the EIMT schedule covering EIMT by Authorisees and withdrawal for Service Life Assessment and refurbishment candidates.

d. The processes and procedures governing the specification of EIMT requirements to Authorisees.

e. The processes and procedures for gaining assurance that the specified EIMT has been correctly undertaken.

f. The processes and procedures for reviewing and sentencing the results of EIMT by the Design Authority.

Further Sources of Guidance

6. The table below lists further guidance related to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-009	Examination, Inspection, Maintenance and Testing of items Important to Safety.
ONR Technical Inspection Guides	ONR NS-INSP-GD-028	LC28: Examination, Inspection, Maintenance and Testing (EIMT).
IAEA Safety Standards	NS-G-2.6	Maintenance, Surveillance and In-Service Inspection in Nuclear Power Plant
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities EMT.1-7.

Regulation AC29 Guidance Note

Duty to Carry out Tests, Inspections and Examinations

Introduction

1. The purpose of this Condition is to enable DNSR, following consultation, to require the Authorisee to perform any tests, inspections and examinations that it may specify, and to be provided with the results.

Scope

2. This guidance relates to the carrying out of tests, inspections and examinations as specified by DNSR in addition to any carried out under Authorisation Condition 28 (AC28).

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for the arrangements to carry out inspections, tests and examinations as specified by DNSR.

b. The arrangements for carrying out such inspections, tests and examinations.

c. The appropriate approval routes for carrying out such inspections, tests and examinations.

d. The arrangements for assessing such inspections, tests and examinations and providing the results to DNSR and other necessary stakeholders.

e. The arrangements for ensuring the provision of evidence to agreed dates, taking account of the operational requirements.

f. The arrangements in place for producing and keeping records. Records are considered under AC6.

Further Sources of Guidance

4. The table below lists further guidance relevant to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-029	LC29: Duty to carry out Tests, Inspections and Examinations
IAEA Safety Standards	IAEA NS-G-2.6	Maintenance, Surveillance and In-Service Inspection in Nuclear Power Plants
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities EMT.1-7

Regulation AC30 Guidance Note

Periodic Shutdown

Introduction

1. It is necessary for an operating nuclear installation to be shut down at regular intervals for inspection and testing of essential components. The maintenance schedule will define the required intervals. The purpose of this Condition is, therefore, to ensure that the plant is shut down in accordance with the plant maintenance schedule and these important examination and maintenance activities are carried out. The Condition also gives DNSR the power to intervene and require the Authorisee to seek DNSR's consent to restart operations following the completion of the necessary maintenance.

Scope

2. Periodic shutdown refers to the shutdown of either the whole or part of the installation, naval reactor plant, or relevant support equipment to enable the safe conduct of examination, inspection, maintenance or testing according to the requirements of the maintenance schedule. The scope of AC30 does not cover the periodic withdrawal of nuclear weapons; this requirement is described at FAC6.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for the arrangements that ensure that periodic shutdowns are undertaken to meet EIMT requirements.

b. The arrangements to ensure shutdown to enable scheduled EIMT to be undertaken.

c. The arrangements for considering, justifying and obtaining the required approval to extend or reduce the period before scheduled shutdown, and for verifying and reporting the satisfactory completion of EIMT.

d. The arrangements for recording the extension and amending future shutdown plans where applicable.

e. The arrangements to ensure start up is not commenced without the consent of DNSR where so specified by DNSR.

f. The arrangements in place for producing and keeping of relevant records of scheduled shutdowns and the work carried out. Records are considered under Authorisation Condition 6 (AC6) and AC25.

g. The arrangements for managing the interface with Authorisees with Design Authority responsibilities to enable such EIMT to take place.

Additional Guidance for Authorisees with Design Authority Responsibilities

4. Consideration should be given to the following:

a. The management responsibilities, interfaces and boundaries of all personnel responsible for managing and specifying the requirements for periodic shutdowns.

b. The processes and procedures governing the planning of the examination, inspection, maintenance, and testing to be undertaken, including the safety case.

c. The arrangements for considering, justifying and approving extensions, or reduction, to the period before scheduled shutdown and verifying the satisfactory completion of the EIMT.

d. The arrangements controlling interactions with Authorisees.

Further Sources of Guidance

5. The table below lists further guidance relevant to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-030	LC30: Periodic Shutdown.
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities EMT.1-8

Regulation AC31 Guidance Note

Shutdown of Specified Operations

Introduction

1. If DNSR has concerns about the safety of any installation, nuclear weapon, naval reactor plant, component, relevant support equipment or process and the Authorisee is unable or unwilling to provide the necessary safety case for continued operation, DNSR must have the power to order the shutdown of the plant or process. The purpose of this Condition is to give DNSR the power to instruct the Authorisee to shut down any plant, operation or process within a given period. Following a direction to shut down the Authorisee will require a consent from DNSR to restart operations.

2. This Condition also gives discretionary powers to the DNSR to direct Authorisees with Design Authority responsibilities to withdraw the Approval for service use of a nuclear weapon, naval reactor plant, component or relevant support equipment and to require the consent of DNSR prior to reinstating any Approval.

Scope

3. This guidance relates to the directed cessation of any defence nuclear activities.

4. This guidance also relates to the withdrawal of the Approval for Use of any nuclear weapon, naval reactor plant, component or relevant support equipment. Authorisees with Design Authority functions must have arrangements in place to instruct any Authorisees to shutdown specified operations with any nuclear weapon, naval reactor plant, component or relevant support equipment for which Approval for Use is withdrawn.

Guidance to Authorisees

5. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities, interfaces and boundaries of all personnel responsible for ensuring that there are arrangements to respond to a requirement to shutdown or withdraw Approval, if so directed by DNSR.

b. The process by which the Authorisee will respond to DNSR's direction to shutdown.

c. The processes and procedures employed by Authorisees with Design Authority responsibilities to implement a direction from DNSR to withdraw Approval for Use and to instruct an Authorisee or duty holder to shutdown specified operations.

d. The arrangements through which the restarting of activities will be justified and a consent obtained from DNSR following shutdown under a DNSR direction. Authorisees with Design Authority functions should give due consideration to the processes and procedures employed for seeking DNSR consent to reinstate Approval for Use.

e. The arrangements for managing the interfaces between all Authorisees to enable shutdown within a given period.

Further Sources of Guidance

6. The table below lists further guidance relevant to this AC:

ONR Technical Inspection Guides	ONR NS-INSP-GD-031	LC31: Shutdown of Specified Operations (Currently withdrawn)
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities.

Regulation AC32 Guidance Note

Accumulation of Radioactive Waste

Introduction

1. The purpose of this Condition is to ensure that the Authorisee has adequate arrangements to ensure that the production and accumulation of radioactive waste is minimised. The Condition also gives DNSR the power to ensure that radioactive waste is stored under suitable conditions, and that adequate records are kept to enable DNSR to monitor the management of radioactive waste on Authorised sites.

Scope

2. This guidance relates to the arrangements for the storage and minimising the rate of production and the total quantity of radioactive waste accumulated. It also includes the generation and the maintenance of records of the radioactive waste accumulated.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for the accumulation and recording of radioactive waste.

b. The relevant Environment Agency/Scottish Environment Protection Agency Authorisations (EA/SEPA), permits, Noting Letters and Agreements or their equivalents under EPR and EA(S)R. Where the disposal of any radioactive waste has been authorised or permitted by EA/SEPA, the arrangements in respect of its prior accumulation should be in accordance with any requirements which may have been specified as part of that authorisation or permit, and the existence of such requirements should be explicitly stated. For activities under Crown control the EA and SEPA issue, respectively, approvals or letters of agreement of formal authorisations, or their equivalents under EPR and EA(S)R.

c. The arrangements for minimising the rate of production and total quantity of radioactive waste accumulated.

d. The arrangements for managing the accumulation and storage of radioactive waste.

e. The arrangements for the generation of records and the recording of radioactive waste accumulated. These requirements are in addition to the general record keeping requirements in respect of nuclear matter (which includes radioactive waste) considered under Authorisation Condition 4.

f. The arrangements for ensuring that any conditions, with respect to accumulation of waste, required by the disposal authorisation are clearly identified and met.

g. Any radioactive waste as a result of an accident involving radioactive material.

Further Sources of Guidance

4. The table below lists further guidance relevant to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-24	Management of Radioactive Materials and Radioactive Wastes on Nuclear Licensed Sites.
ONR Technical Inspection Guides	ONR NS-INSP-GD-032	LC32 – Accumulation of Radioactive Wastes.
IAEA Standards	GS-G-3.3	The Management System for the Processing, Handling and Storage of Radioactive Waste
	GSR Part 5	Predisposal Management of Radioactive Waste
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Safety RW.1-7
IAEA Standards	SSG-40	Predisposal Management of Radioactive Waste from Nuclear Power Pants and Reaseach Reactors
IAEA Standards	SSG-41	Predisposal Management or Radioactive Waste from Nuclear Fuel Cycle Facilities
UK Government Legislation	IRR-17	The Ionising Radiation Regulations 2017
MOD Agreements With Environmental Regulators		Agreement between the MOD and SEPA on matters relating to Radioactive Substances.
		Memorandum of Understanding between the MOD and the Environment Agency.

Regulation AC33 Guidance Note

Disposal of Radioactive Waste

Introduction

1. An Authorisee may wish to store radioactive waste on its site rather than dispose of it even when a suitable disposal facility is available. The purpose of this Condition is to give DNSR the power to direct the Authorisee to dispose of radioactive waste which is stored on the Authorised site. DNSR would only use this power in conjunction with the appropriate Agency.

2. In this context “the appropriate Agency” means, in relation to England, the Environment Agency, in relation to Wales, Natural Resources Wales, and, in relation to Scotland, the Scottish Environment Protection Agency.

Scope

3. This guidance relates to the disposal of accumulated or stored radioactive waste.

Guidance to Authorisees

4. Any DNSR direction under this Condition will require disposal to be made in accordance with an existing Authorisation, approval, permit, letter of agreement or consent, as the case may be. The Authorisee should therefore provide sufficiently comprehensive evidence that references the management arrangements already established for compliance with such Authorisation, approval, permit, letter of agreement or consent and provide assurance that such arrangements would be implemented.

Further Sources of Guidance

5. The table below lists further guidance relevant to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-024	Management of Radioactive Materials and Radioactive Waste on Nuclear Licensed Sites.
ONR Technical Inspection Guides	ONR NS-INSP-GD-033	LC33 – Disposal of Radioactive Waste
IAEA Standards	SSR-5	Disposal of Radioactive Waste. 2011
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Safety., 2014 SAP RW.1-7
MOD Agreements With Environmental Regulators		Agreement between the MOD and SEPA on matters relating to Radioactive Substances.
		Memorandum of Understanding between the MOD and the Environment Agency.

Regulation AC34 Guidance Note

Leakage and Escape of Radioactive Material and Radioactive Waste

Introduction

1. On Authorised sites DNSR has the responsibility for regulating the management of radioactive material and radioactive waste. It is therefore important for DNSR to have confidence that it knows where the Authorisee is storing such waste and materials and its condition. The purpose of this Condition is to place a duty on the Authorisee to ensure so far as is reasonably practicable that radioactive material and radioactive waste is adequately controlled and contained so as to prevent leaks or escapes, and that in the event of any fault or accident which results in a leak or escape, the radioactive material or radioactive waste can be detected, recorded and reported to DNSR.

Scope

2. This guidance relates to any potential leakage or escape of solid, liquid or gaseous radioactive material or radioactive waste even regardless of whether there is an immediate effect on nuclear or radiological safety. The guidance does not apply to discharges or releases of radioactive waste in accordance with an authorisation granted under the permit granted under EPR, EA(S)R or equivalent arrangements approved by DNSR.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for controlling and containing radioactive material and radioactive waste in order to prevent its leakage or escape.

b. The arrangements for controlling and containing radioactive material and radioactive waste in order to prevent its leakage or escape.

c. The arrangements for detecting any leakage or escape of radioactive material or radioactive waste.

d. The arrangements for notifying, recording, investigating and reporting any leakage or escape of radioactive material or radioactive waste in accordance with the arrangements made under Authorisation Condition 7 (AC7). This should cover not only

equipment which provides continuous indication (level alarms, radiation alarm etc.) but also the monitoring activities associated with the storage, such as health physics surveys and regular visual checks.

e. The Authorisee should define the levels at which reporting of leakage or escape as an incident under AC7, is to be carried out.

f. Maintenance and testing of any equipment used for compliance with this Condition, including integrity of waste storage facilities and associated systems and functionality of alarms etc. should form part of the arrangements and should meet the requirements of AC28.

Further Sources of Guidance

4. The table below lists further guidance relevant to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-024	Management of Radioactive Materials and Radioactive Waste on Nuclear Licensed Sites
ONR Technical Inspection Guides	ONR NS-INSP-GD-034	LC34: Leakage and Escape of Radioactive Material and Radioactive Waste.
IAEA Standards	GS-G-3.3	The Management System for the Processing, Handling and Storage of Radioactive Waste
	GSR Part 5	Predisposal Management of Radioactive Waste.
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Safety. SAPs RW.1-7

Regulation AC35 Guidance Note

Decommissioning

Introduction

1. It is important that when a nuclear facility, nuclear weapon, naval reactor plant, component or relevant support equipment reaches the end of its operational life it is decommissioned in a safe and controlled manner and not left to pose a hazard for current and future generations. The purpose of this Condition is therefore to require the Authorisee to have adequate arrangements for the safe decommissioning of facilities, nuclear weapons, naval reactor plant, components or relevant support equipment. It also gives DNSR the power to direct the Authorisee to commence decommissioning of any facility, nuclear weapon, naval reactor plant, component or relevant support equipment to prevent it being left in a dangerous condition or to ensure decommissioning takes place in accordance with any national strategy. Adequate fall back plans should be in place to support unforeseen/early decommissioning of a nuclear weapon, stockpile, facility or naval reactor plant. The Condition also gives DNSR the power to direct the Authorisee to halt any decommissioning activity if DNSR has concerns about its safety.

Scope

2. This guidance relates to the planning and conduct of decommissioning activities where there are nuclear or radiological hazards.

3. Compliance with applicable Authorisation Conditions is required until it is demonstrated to DNSR's satisfaction that there has ceased to be any danger from ionising radiation.

Guidance to Authorisees

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities, interfaces and boundaries of all personnel responsible for decommissioning.

b. The overall policy, production of detailed or outline decommissioning and disposal plans with clearly defined 'hold points', the proposed disposal routes and any anticipated problems or areas of future difficulty for decommissioning.

c. The process governing the maintenance of the capability (including, funding, personnel, equipment and facilities etc.) necessary to ensure that decommissioning can be achieved within a safe timescale.

d. The arrangements to ensure that documentation to justify the safety of the undertakings is produced and assessed in accordance with the Authorisee's arrangements for AC14.

e. The arrangements to ensure that decommissioning plans are periodically reviewed.

f. The arrangements to ensure that lessons learned from other similar decommissioning projects are identified and applied.

g. DNSR may consent to de-Authorisation of a site (or part thereof) once there are no longer Authorisable activities being conducted thereon. However, depending on the future ownership of the site (or part thereof), DNSR may also need to be satisfied that it has been decommissioned to the extent that any residual hazards and risks arising are sufficiently low that DNSR regulation is no longer required.

h. The management interface arrangements with other Authorisees to enable decommissioning within a given period.

Additional Guidance for Authorisees with Design Authority Responsibilities

5. Consideration should be given to the following:

a. The processes and procedures for ensuring that adequate capability exists to withdraw and decommission nuclear weapons, naval reactor plant, components and relevant support equipment, including:

(1) decommissioning as part of the normal CADMID cycle; and

(2) the maintenance of a continuous decommissioning capability sufficient to enable the early and safe withdrawal and decommissioning of stockpile or plant items in response to, for example, unfavourable service life assessment findings.

b. The arrangements for the production, agreement and management of a decommissioning programme for nuclear weapons, naval reactor plant, components and relevant support equipment, which includes the interfaces, interactions and dependencies with all other Authorisees and stakeholders.

c. The processes and procedures for ensuring that all items within the stockpile or plant remain capable of being withdrawn and decommissioned within their known safe life.

d. The arrangements for providing necessary nuclear and radiological safety documentation to justify the safety of the proposed decommissioning and its submission to the Defence Nuclear Safety Regulator.

Further Sources of Guidance

6. The table below lists further guidance relevant to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-026	Decommissioning
ONR Technical Assessment Guides	ONR NS-TAST-GD-051	The Purpose, Scope and Content of a Nuclear Safety Case
ONR Technical Inspection Guides	ONR NS-INSP-GD-035	LC35: Decommissioning
IAEA Safety Standards	WS-G-5.2	Safety Assessment for the Decommissioning of Facilities Using Radioactive Material.
	GSR Part 6	Decommissioning of Facilities.
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Safety DC.1-9, RL.1-8
UK Government Response to Consultatation	No reference present.	Amending the Framework for the Final Stages of Nuclear Decommissioning and Clean-up. BEIS 2018

Regulation AC36 Guidance Note

Organisational Capability

Introduction

1. The purpose of this Condition is to ensure that the Authorisee maintains adequate financial and human resources to ensure the safety of Authorised activities, and implements adequate arrangements to control any change to its justified baseline organisational structure or resources which may affect safety. The Condition also gives DNSR the power to direct the Authorisee to halt an organisational change at any stage in the interest of safety.

Scope

2. This guidance provides advice on the arrangements for maintenance of adequate financial and human resources and the management of change to the organisation which delivers and manages safety. The scope of organisational changes ranges from high level changes, e.g. management board reorganisations or agency mergers, to low level changes; this includes the reduction of manpower in response to cost saving measures and the increased use of contractors. The arrangements should reflect the roles needed to carry out the full range of Authorised activities including normal operations, decommissioning projects, maintenance, examination and testing, emergency response, etc. The governance of nuclear safety and Intelligent Customer functions are an integral part of the nuclear baseline.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

Adequate Arrangements

4. The Authorisee should demonstrate that adequate arrangements have been made and implemented to provide and maintain adequate financial and human resources, and to control and justify any changes to the organisational structure or resources. Such arrangements should include a description of the Authorisee's:

a. nuclear baseline;

b. procedures for organisational change;

c. arrangements for assessing and obtaining the financial resources necessary to continue to ensure the safety of Authorised activities.

Nuclear Baseline

5. The nuclear baseline should be documented, and that documentation should identify and justify all safety significant aspects of the organisation, including:

a. The purpose of the organisation.

b. Senior management and their responsibilities.

c. Lines of accountability from the workforce to senior management.

d. Description of the staff comprising the organisation, including:

(1) numbers of staff required;

(2) identification of roles with safety responsibilities requiring the post holders to be Suitably Qualified and Experienced Persons (SQEP), including those with safety responsibilities to the Authorisee who are not part of the organisation; there needs to be an emphasis on sufficient in-house technical resource and Intelligent Customer aspects;

(3) identification of roles with specific nuclear safety responsibilities requiring the post holders to be Duly Authorised Persons;

(4) terms of reference and job descriptions; and

(5) training, qualification and experience requirements plan.

e. Arrangements for the employment of contractors.

6. The nuclear baseline should undergo periodic review to identify current or potential weakness in nuclear safety capability against the current and future demands, utilising tools such as vulnerability assessment.

Procedures for Organisation Change

7. Arrangements for organisational change should be robust, incorporated as part of the Authorisee's management system and applied to all changes that have the potential to impact on nuclear safety. Consideration should be given to:

a. Role of Senior Management. A statement of senior management commitment should be produced, including: acceptance of their responsibility; recognition that the

management of safety is a key business objective; and a description of control of their organisation.

b. Project Management. The arrangements for proactive management of the change should be described, including the means by which proposed changes are to be planned, developed, assessed and subsequently implemented.

c. Classification. As with equipment modifications, changes to the organisational structure or resources are to be classified according to their safety significance. This is to enable the application of a degree of scrutiny and review commensurate to the impact of the proposed change. This in turn should be based upon an assessment of the consequences of a management failure due to the organisational changes and the subsequent loss of control of a safety significant activity.

d. Documentation. The arrangements should provide for adequate documentation to justify any proposed change. This should include:

(1) Recognition of the safety implicated aspects of the nuclear baseline arrangements.

(2) Consideration of options.

(3) Principles for change.

(4) Demonstration of how the revised organisation is to function, highlighting the effect of change from the datum.

e. Review and Assessment. The arrangements for independent review and assessment, depending upon classification, should be described, including any arrangements for independent peer review.

f. Submission. The Authorisee's arrangements should cover the submission of any documentation called for review by DNSR, and should recognise the need to stop the change or operational programme if so directed by DNSR due to concerns with the safety implications.

g. Audit and Feedback. The arrangements for audit of an organisation post implementation or change should be described, to provide assurance that the change has been correctly implemented, and that the arrangements are robust on completion.

Further Sources of Guidance

8. The table below lists further guidance relevant to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-048	Organisational Change
	ONR NS-TAST-GD-049	Licensee Core Safety and Intelligent Customer Capabilities
	ONR NS-TAST-GD-061	Staffing Levels and Task Organisation
	ONR NS-TAST-GD-065	Function and Content of the Nuclear Baseline
	ONR NS-TAST-GD-072	Function and Content of Safety Management Prospectus
	ONR NS-TAST-GD-079	Licensee Design Authority Capability
	ONR NS-TAST-GD-080	Challenge Culture, Independent Challenge Capability (Including an Internal Regulation Function), and the Provision of Nuclear Safety Advice
IAEA Standards	INSAG-13	Management of Operational Safety in Nuclear Power Plants.
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities SAPs MS.1-4
Safety Directors Forum	Good Practice Guide	Nuclear Baseline and the Management of Organisational Change

Regulation FAC1 Guidance Note

Duty of Co-Operation

Introduction

1. This Condition results from the mobility of reactors and weapons in the Defence Nuclear Enterprise, and the separate responsibilities of Authorisees with Design Authority responsibilities. The first purpose of the Condition is to maintain coherent arrangements between Authorisees to ensure the safe transfer of reactors or weapons from one to the other. The second purpose of the Condition is to maintain arrangements for co-operation between Authorisees to ensure that appropriate design control is exercised throughout reactor or weapon life and across life-cycle phases. Finally, the Condition ensures that arrangements are made for co-operation with independent organisations (e.g. contractors) and internally within the Authorisee's organisation where this is necessary to maintain safety.

Scope

2. This guidance relates to the factors that Authorisees should consider to ensure that they co-operate with other Authorisees and with other organisations (both external and internal to the Authorisee).

Guidance to Authorisees

3. The responsibility for nuclear and radiological safety within the Defence Nuclear Enterprise remains ultimately with the Authorisee and cannot be delegated in whole or in part to another body/person. This responsibility cannot, however, be discharged by lone Authorisees without information, support and co-operation from other Authorisees in the DNE.

4. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities for all personnel who interface with other Authorisees who transfer reactor plant or weapon materiel or information across Authorisee accountabilities;

b. The documented arrangements that provide for the coherent management of such transfers including reference to the other Authorisees' arrangements;

c. The arrangements to ensure the provision of adequate information on nuclear weapon, naval reactor plant, component and relevant support equipment safety to each

Authorisee or other organisation, to enable them to discharge their nuclear and radiological safety responsibilities.

d. The management responsibilities for all personnel who interface with Design Authorities or Responsible Designers which provide information on reactor plant or weapons;

e. The documented arrangements that support intelligent management of such information;

f. The arrangements by which Authorisees assure one another about nuclear and radiological safety;

g. The contractual or other enforceable arrangements to cover the nuclear and radiological safety responsibilities of external organisations;

h. The documented arrangements for internal co-operation including links with related ACs, notably AC 7, 11, 13, 17 and 36, necessary to ensure that the Authorisee's safety management arrangements are effective and consistently implemented, including feedback to Authorisees with Design Authority responsibilities.

Additional Guidance for Authorisees with Design Authority Responsibilities

5. The responsibility for nuclear and radiological safety within the NNPP and NWP remains ultimately with the Authorisees and cannot be delegated in whole or in part to another body/person. This responsibility cannot, however, be discharged by the Authorisees without information from and co-operation with the Authorisee with Desgn Authority responsibilities for the nuclear weapon, naval reactor plant, component or relevant support equipment.

6. Consideration should be given to the following:

a. The arrangements to ensure the provision of adequate information on nuclear weapon, naval reactor plant, component and relevant support equipment safety to each Authorisee or other organisation, to enable them to discharge their nuclear and radiological safety responsibilities.

b. The arrangements the Authorisee with Design Authority Responsibilities has in place to gain assurance that the activities undertaken by Authorisees or other organisations will not compromise the safety of the nuclear weapon, naval reactor plant, components or relevant support equipment.

Regulation FAC2 Guidance Note

Operational Berths

Introduction

1. This Condition results from the need for UK nuclear powered warships to berth at operational berths outwith Authorised sites, including those in foreign countries. Operational Berths (OB) form de facto temporary nuclear sites. In permissioning the use of an OB, DNSR takes into account the wide variety of geographical locations, and hence the diverse legal frameworks (see JSP471 Annex I). The purpose of this Condition is to ensure that regulatory consent is obtained for the use, and the scope of such use, of an OB by a nuclear powered warship.

Scope

2. This guidance relates to the use by UK nuclear powered warships of any OB in any location.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that the safety management organisation and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management responsibilities of all personnel responsible for the justification and management of OBs.

b. The arrangements for providing an adequate and proportionate safety justification for OBs, which:

(1) Defines the scope of permissible operations at the berth, including limits and conditions of operation;

(2) Justifies the siting of the OB;

(3) Provides adequate substantiation of all aspects of the support required by the vessel from the berth;

(4) Demonstrates that no feature of the berth itself presents a hazard to the vessel that is that is not appropriately controlled or mitigated;

(5) Demonstrates that the emergency response arrangements are adequate.

c. The safety management arrangements for controlling activities at OBs in accordance with the safety justification. The arrangements should demonstrate how each AC is met at the berth, or why it is not relevant, if that is the case.

d. The arrangements for compliance with the requirements of REPPIR[5], including:

(1) Production of a site-specific Hazard Evaluation and Consequence Assessment (HECA) for each berth;

(2) Provision of a Consequences Report (CR) of the HECA[6];

(3) Provision and testing of an Operator's Emergency Plan (OEP) in the event that the HECA concludes that a radiation emergency is reasonably foreseeable, including berth-specific arrangements, and weapon-related arrangements if the berth is to be used by SSBNs. An OEP should be tested and reviewed at intervals not exceeding 3 years, or prior to the next nuclear powered warship visit if this requirement has not been met;

(4) The requirement, if applicable, for an Off-Site Emergency Plan. Although this is formally the responsibility of the civil authorities, the status of the off-site plan may be taken into account by DNSR when considering whether to issue consent to use the berth;

(5) The arrangements for reassessment of the berth by the operator at intervals not exceeding three years, based upon the REPPIR review frequency.

e. Regulatory consent will be limited to those activities included within the scope; additional activities that have nuclear safety implications will require further specific formal regulatory consent.

Visiting Nuclear Powered Warships

4. Visiting NPW will be considered on the same basis as Royal Navy NPW. Arrangements should be in place at all UK (including berths on Authorised sites) and Overseas Territory berths for visiting NPW that mirror those for UK NPW up to the edge of the quay, berth or other structure. Arrangements aboard the vessel are exempt from UK legislation as described in JSP 471.

[5] Although legally only applicable to UK and Gibraltar, the principles of REPPIR should be applied to all OBs. For those OBs outside UK or Gibraltar, REPPIR reports will only need to be submitted to the DNSR.

[6] Where there is no statutory requirement for a CR (outside UK or Gibraltar), this separate document need not be produced, so long as the HECA contains and cross-references all information specified in REPPIR 19 Schedule 4.

Further Sources of Guidance

5. The table below lists further guidance relevant to this AC:

Technical Assessment Guides	DNSR TAG/002	Operational Berths
	ONR TAST-GD-082	The Technical Assessment of REPPIR Submissions
Approved Code of practice	ONR/HSE	REPPIR 2019 Approved Code of Practice
MoD Joint Service Publication	JSP 471	Defence Nuclear Accident Response

Regulation FAC3 Guidance Note

Radioactive Discharges

Introduction

1. This Condition results from the need for environmental controls equivalent to those in legislation to apply to all parts of the Defence Nuclear Enterprise. The purpose of this Condition is to ensure that discharges of radioactive material are minimised and controlled and subject to regulatory consent. DNSR will conduct assessments in accordance with the principles and methodologies adopted for this purpose by EA and SEPA under EPR, or EA(S)R.

Scope

2. The discharge of radioactive material to the environment from defence licensed sites is regulated by the statutory regulators (Environment Agency/Scottish Environment Protection Agency (EA/SEPA)) under the Environmental Permitting (England and Wales) Regulations (EPR)/Environmental Authorisation (Scotland) Regulations (EA(S)R). EPR Schedule 23 and EA(S)R Schedule 8 do not apply to premises occupied on behalf of the Crown for naval, military or air force purposes (Schedule 4 and Part 17 refer respectively). However, radioactive discharges from non-licensed, Authorised sites are subject to regulation by EA/SEPA in accordance with arrangements between MOD and EA/SEPA. This EA/SEPA regulation specifically does not cover discharges directly to the environment from Nuclear Powered Warships (NPW) either within licensed or Authorised sites or outwith such sites.

3. By the nature of reactor and weapon design, gaseous radioactive discharges arise from both the weapon and propulsion programmes. Discharges of low-level liquid radioactive waste arise from the propulsion programme, and liquid radioactive waste may also arise from the weapon programme as a result of oxidation and condensation of original gaseous material.

4. The scope of the DNSR regulation under Further Authorisation Condition 3 (FAC3), and in particular the direction referred to at Clause (2) thereof, is specifically limited to those parts of the programme which are not subjected to regulation by EA/SEPA either under EPR, EA(S)R or by agreement with MOD, i.e. to discharges directly to the environment from NPW. Thus DNSR will only issue consents under FAC3 in relation to the following activities:

a. low-level gaseous radioactive discharges from NPW directly to the environment;

b. the discharge of low-level liquid radioactive waste from NPW directly to the environment where it is not practicable for this to be transferred ashore for processing and discharge under EA/SEPA regulation; for practical purposes it is anticipated that this will be restricted to the discharge of low-level liquid radioactive waste from submarines at sea.

5. All other radioactive waste from NPW should be transferred ashore for processing and discharge under EA/SEPA.

6. Further, DNSR consents under FAC3 will cover only discharges arising from routine NPW operations, including urgent operational requirements, but specifically not discharges which may arise as a result of an accident or emergency.

Submissions for Consent

7. In all cases discharges are anticipated to be low but, as a minimum, one-off assessments should be carried out on a pessimistic basis to estimate the maximum quantities of radioactive material that may be discharged. Comparison with exemption levels set out in extant EPR or EA(S)R should confirm that no regulatory consent to discharge is required. Alternatively such consent may be required either on a regular or precautionary basis.

8. duty holders as identified below are responsible for carrying out the necessary assessments and seeking DNSR consent as required:

a. Site Authorisees (with support from Authorisees with Design Authority responsibilities) are responsible for carrying out the assessments and seeking DNSR consent as required to discharge gaseous radioactive waste from NPW within their sites;

b. Authorisees for the “at sea” phase (with support from Authorisees with Design Authority responsibilities) are responsible for carrying out the assessments and seeking DNSR consent as required to discharge gaseous radioactive waste from NPW at operational berths and at sea;

c. Authorisees for the “at sea” phase (with support from Authorisees with Design Authority responsibilities) are responsible for carrying out the assessments and seeking DNSR consent as required to discharge liquid radioactive waste from NPW at sea;

9. The submission should address the following key objectives:

a. to show that all discharges of radioactive waste are minimised and controlled;

b. to identify the arrangements for maintaining records of discharges and the particular details that will be recorded;

c. to demonstrate that the resulting radiation doses received by members of the public are As Low As Reasonably Practicable (ALARP);

d. to estimate by calculation/modelling etc. the radiological consequences arising (or upper bound thereof), in particular the resulting radiation doses to members of the public, and to show that these are below dose constraints for radioactive waste discharges as set out in extant Government or similar publications;

e. To identify any requirement for environmental monitoring in order to validate the estimated radiological consequences or conversely to demonstrate that in view of the very low levels of the discharges no such monitoring is required.

10. Submissions for consent to discharge should address each applicable paragraph of the FAC, and should identify a date for review.

11. Whilst not prescriptive, it is anticipated that submissions will cover all routine discharges over a defined period (a period of one year will normally be suitable), with limits proposed on a bounding basis in respect of each identified site (i.e. Authorised site or Operational Berth) and, on an aggregated basis, for all discharges outwith designated sites (i.e. at sea). In principle, the form of the submission should be consistent with EA or SEPA requirements under EPR or EA(S)R, but moderated as appropriate on a proportionate basis reflecting the very low levels of discharge in this case.

12. DNSR will conduct assessments in accordance with the principles and methodologies adopted for this purpose by EA or SEPA under EPR or EA(S)R, moderated as appropriate on a proportionate basis reflecting the very low levels of discharge in this case.

13. Regulatory consent to discharge will be conditional upon continued compliance with the arrangements set out in the submission, including periodic review. DNSR may limit the duration of a consent, and may review consents in light of any significant change in circumstances. Any potential or actual breach of a consent should be notified to DNSR immediately.

Further Sources of Guidance

14. The table below lists further guidance relevant to this AC:

DNSR Technical Assessment Guides	TAG 008	Guidance on the Regulation of Radioactive Discharges
MOD Agreements with Environmental Regulators		Agreement between the MOD and SEPA on matters relating to Radioactive Substances.
		Memorandum of Understanding between the MOD and the Environment Agency.

Regulation FAC4 Guidance Note	**Unused.** **Please refer to Condition TC1 for guidance on Transport Packages**

Regulation FAC5 Guidance Note

Design of a Nuclear Weapon or Naval Reactor Plant

Introduction

1. The purpose of this Condition is to ensure that an Authorisee with Design Authority responsibilities provides and implements adequate control over the design of a nuclear weapon or naval reactor plant, to ensure that it can deliver through-life nuclear and radiological risk which is ALARP through life.

2. The intent behind the condition is that the Authorisee plans concurrent and integrated design and safety analysis to inform the design to ensure that reasonably practicable risk reduction options are embedded in the design.

Guidance on the Demonstration of the ALARP Principle

3. As stated in the Introduction, the Authorisee with Design Authority responsibilities should provide and implement adequate control over the design of a nuclear weapon or naval reactor plant, to ensure that it can deliver through-life nuclear and radiological risk which is ALARP through life. In doing so the Authorisee should be able to demonstrate that the design:-

a. has reduced the nuclear and radiological risks ALARP through life;

b. has been subject to an appropriate and rigorous analysis and assessment programme, which has not foreclosed options before due consideration has been given to nuclear and radiological safety.

c. does not require 'Retrospective ALARP'[7] justifications to compensate for shortfalls.

d. has been exposed to regulatory engagement and scrutiny throughout its development process i.e. 'no surprises'.

e. is based upon sound scientific and engineering evidence, supported by rigorous safety assessment and analysis (i.e. application of the 'claims, arguments and evidence' model).

[7] 'Retrospective ALARP' in the context of future plant or weapon design is where a cost/benefit argument is used to reject implementation of design improvements late in the design process, brought about by the failure to identify and implement the ALARP options in a timely manner.

Guidance on Through Life Design

4. The introduction of a new naval reactor plant or nuclear warhead does not end the design process as the design intent needs to be maintained through life. The design should have been adequately demonstrated to reduce risks ALARP through life. The Authorisee should be able to adequately demonstrate that the design intent is maintained and continues to meet the design requirements through life via appropriate management arrangements. DNSR may choose to assess such arrangements as part of its routine compliance inspection activities.

5. DNSR will seek to gain assurance from the Authorisee with Design Authority responsibilities that the safety of the design in question is being adequately maintained through life.

6. Where a design modification is required, DNSR will consider the case for modification under AC22 and will seek assurance that any modification to a design will not adversely affect the nuclear or radiological safety of the naval reactor plant or nuclear warhead in service.

Guidance to Authorisees

DSA02–DNSR FAC5 Clause 1
Where an Authorisee with Design Authority responsibilities proposes to design a nuclear weapon or naval reactor plant they shall make and implement adequate arrangements to control the design.

Guidance supporting DSA02–DNSR FAC5 Clause 1

7. The Authorisee with Design Authority responsibilities may use a “Responsible Designer”, as defined in DSA02, to support the design and safety analysis for the project. However, the use of a Responsible Designer does not remove the need for the Design Authority function to maintain an Intelligent Customer capability.

8. A Responsible Designer will typically be a major engineering company with its own internal processes for project and safety risk management. The Authorisee with Design Authority responsibilities may wish to benefit from and claim credit for these processes in the execution of the design phase of the project in order to reduce potential duplication of reviews and facilitate progress toward scheme design or staged safety case completion. In such cases, DNSR will seek to gain assurance of the following:-

a. The retention and demonstration of the Approval Role at all times by the Authorisee with Design Authority responsibilities. This needs to be supported by demonstration of an Intelligent Customer capability. Further regulatory guidance is given in the relevant publications list at the end of this section.

b. An independent peer review of the safety analysis, commissioned by the Design Authority function against appropriate safety principles and criteria, should be carried out to support the design at each project stage. The peer review should be independent of the delivery organisation and should report its findings to the Design Authority function, who should demonstrably take ownership of the safety analysis.

c. The identification in safety documentation of where benefit is to be taken for Responsible Designers' internal processes and reviews and the manner of Authorisee input, oversight and control.

d. Demonstration of the understanding of, and acceptance by the Responsible Designer of the requirements necessary to provide goods or services to the Intelligent Customer.

e. Demonstration of how the Responsible Designers' internal processes fit into a staged design process to meet the requirements and expectations outlined above.

9. The Authorisee with Design Authority Responsibilities will always be required to demonstrate to DNSR that the design delivers nuclear and radiological risk which is ALARP through life for the naval reactor plant, nuclear weapon, or equipment being designed. Design milestones are therefore represented by Authorisee approval stages as defined in the SJP, not by completion of a Responsible Designer's internal process.

DSA02–DNSR FAC5 Clause 2
The arrangements shall include a requirement for the provision of adequate documentation to justify the safety of the proposed design and the Authorisee with Design Authority responsibilities shall provide for the submission of this documentation to DNSR.

Guidance supporting DSA02–DNSR FAC5 Clause 2

10. DNSR will seek the demonstration that safety is given adequate consideration at every stage in the design process, with clear demonstration of the maturation of safety concepts as the project progresses through the staged process.

11. The adequacy of Authorisees' arrangements will normally be assessed at agreed points during the staged design process with safety cases produced and approved through internal due process prior to progressing from one stage of the design to the next. The Condition gives DNSR the power (if so specified) to prevent the next design stage being started until DNSR is satisfied with the safety analysis or to put hold points in the design process.

12. The design should be safety informed such that risks have been reduced ALARP through all life-cycle phases. For novel and technically challenging projects and particularly where development work and rig tests or trials feed into the design, the design phase may have several "break points" where the design maturation is reviewed, DNSR would anticipate that at each design stage a relevant safety report is prepared in accordance with the Authorisees own arrangements.

13. The adequacy of the arrangements supporting the production and approval of safety cases will be considered by DNSR alongside the requirements of AC14.

DSA02–DNSR FAC5 Clause 3
The aforesaid arrangements, where appropriate, are to divide the design process into stages. Where DNSR so specifies the Authorisee with Design Authority responsibilities shall not commence nor thereafter proceed from one design stage to the next without the consent of DNSR.

Guidance supporting DSA02–DNSR FAC5 Clause 3

14. Due to the novelty and technical challenge involved in a new naval reactor plant or nuclear weapon, the design process will by necessity progress through several stages. DNSR will not prescribe the specific stages which Authorisees should undertake; Authorisees should apply an appropriate process based upon relevant good practice and any specific requirements imposed by MOD. Authorisees should articulate their proposed staged process in an appropriate safety strategy or plan.

15. The application of a staged design process is to ensure that:

a. the nuclear weapon or naval reactor plant is being designed in accordance with agreed requirements;

b. the radioactive release from nuclear weapon or naval reactor plant during its life cycle from normal activity and the risk (consequences x probability) of Design Basis Accidents are reduced to ALARP.

16. DNSR would normally permission start of construction/manufacture under AC19 on completion of detailed design based on an adequate demonstration of the safety analysis and safety informed design presented in an appropriate safety case. However, DNSR recognises that the design of a nuclear warhead or naval reactor plant is a complex and multi-faceted process, and therefore a single safety case submission may not be adequate to reflect the differing states of design maturity[8] of elements within the overall system[9]. In such cases, the Authorisee is encouraged to engage with DNSR to discuss strategies for methods of delivering ensurance that safety by design is being adequately addressed within the safety case, whilst allowing flexibility for projects to progress at differing rates.

17. Build or manufacture should not start until the design is complete. The 'design' includes all underpinning calculations and concurrent safety analyses, culminating in an approved Certificate of Design (CoD) only issued when a PCSR including ALARP demonstration has been approved for the NRP. In the case of NW, the CoD is issued after the Final Readiness Review (i.e. Design freeze).

18. In practice, there may be sound programme or economic reasons for making or ordering specific components of a system before final completion of the naval reactor plant or nuclear weapon design, but these should be exceptional and identified early in the project. Similarly, technology development issues or opportunities might mean that it is wise to postpone final specification of components which deliver a safety function until well after major equipment definition. DNSR will seek assurance that the SFR's on individual components derived from the NRP PCSR or NW Critical Design Review (i.e. design chill), can and will be met.

DSA02–DNSR FAC5 Clause 4

The Authorisee with Design Authority responsibilities shall submit to DNSR for approval such part or parts of the aforesaid arrangements as DNSR may specify.

[8] The safety of a design should also be considered as part of the MOD procurement cycle at major investment points.

[9] The Pre Construction Safety Report for the NRP broadly equates to Nuclear Warhead Design Freeze, beyond which the safety of the design in question should have been adequately demonstrated. PCSR/Design Freeze should not be equated with a significant investment decision.

Guidance on DSA02–DNSR FAC5 Clause 4

19. Once approved, arrangements are considered ‘frozen’ and shall not be altered or amended without the approval of DNSR. This is to ensure that arrangements are controlled through life. The Authorisee should seek regulatory engagement with DNSR in such cases where alterations or amendments to approved arrangements are sought.

20. DNSR may take the decision to approve specified parts of arrangements. Once approved, arrangements are considered ‘frozen’ and shall not be altered or amended without the approval of DNSR. This is to ensure that arrangements are controlled through life. The Authorisee should seek regulatory engagement with DNSR in such cases where alterations or amendments to approved arrangements are sought.

DSA02–DNSR FAC5 Clause 5
The Authorisee with Design Authority responsibilities shall ensure that once approved no alteration or amendment is made to the approved arrangements unless DNSR has approved such alteration or amendment.

Guidance on DSA02–DNSR FAC5 Clause 5

21. Once approved, arrangements are considered ‘frozen’ and shall not be altered or amended without the approval of DNSR. This is to ensure that arrangements are controlled through life. The Authorisee should seek regulatory engagement with DNSR in such cases where alterations or amendments to approved arrangements are sought.

22. DNSR will seek assurance from both the Authorisee with Design Authority Responsibilities and the Responsible Designer that the safety of the design is being maintained through life, and will apply regulatory hold points where a demonstration of safety is deemed necessary or at key project gates or reviews. All Authorisees should actively seek regulatory engagement at points where design progress results in a closure of options and/or where there is a step change in project risk.

Linkages to other Authorisation Conditions

23. Arrangements for the production and assessment of safety cases associated with the design of a naval reactor plant or nuclear weapon should also be considered against the requirements of AC14.

24. Where an Authorisee has matured a design to the point of manufacture and has gained regulatory permission to progress, there should be an agreed safety case which acts as the baseline design. The requirements of AC19 should be considered to ensure that manufacture will meet the requirements of the design.

25. If during manufacture or construction it is determined that the design should be modified, then the requirements of AC20 should be met to ensure that the safety of modifications to the design can be demonstrated.

26. Finally, modifications to an in service naval reactor plant or nuclear weapon should be considered under AC22. However, where a modification may have an effect on the baseline or frozen design, the through life implications should be considered.

Further Sources of Guidance

27. The table below lists further guidance relevant to this AC:

ONR Technical Assessment Guides	ONR NS-TAST-GD-079	Licensee Design Authority Capability
	ONR NS-TAST-GD-049	Licensee Core Safety and Intelligent Customer Capabilities
	ONR NS-TAST-GD-057	Design Safety Assurance
IAEA Safety Standards	IAEA SSR-2/1	Safety of Nuclear Power Plants: Design
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revision 1 (January 2020)	Safety Assessment Principles for Nuclear Facilities
Safety Directors Forum		All Guidance

Regulation FAC6 Guidance Note

Nuclear Weapon Periodic Withdrawal

Introduction

1. The purpose of this Further Authorisation Condition is to ensure that Authorisees with Design Authority responsibilities develop adequate arrangements to specify to lifecycle Authorisees the requirements and necessary safety documentation (under the auspices of AC14) for nuclear weapons, components and relevant support equipment to be withdrawn from service for examination, inspection, maintenance and testing (EIMT) under the auspices of AC28, in support of programmes such as service life assessment, or as otherwise necessary. The Condition also requires Authorisees to maintain adequate arrangements to comply with any specification made by Authorisees with Design Authority responsibilities in relation to this Condition. The Condition gives DNSR the power to specify that a withdrawn nuclear weapon, component or relevant support equipment shall not be returned to use without the consent of DNSR.

Scope

2. Guidance for this Condition relates to the arrangements for the withdrawal of nuclear weapons, components and relevant support equipment from service. The guidance also relates to the planning of activities such as the service life assessment and refurbishment programmes as defined in the Authorisee's EIMT schedule under the auspices of AC28, and the arrangements for the production of safety documentation supporting such withdrawals under the auspices of AC14. Withdrawal for EIMT activities by, or on behalf of, the Authorisee necessary to ensure the continued safety of the stockpile are within the scope of this Condition.

Guidance to Authorisees

3. The Authorisee should be able to provide sufficiently comprehensive evidence that safety management organisations involved with NW periodic withdrawal and arrangements, including interfaces, are adequate. Consideration should be given to the following:

a. The management structure, responsibilities and interactions between the associated Authorisees, organisations, committees and individuals.

b. The requirements, processes and procedures governing the planning of the examination, maintenance, inspection and testing to be undertaken by the Authorisee, including the safety case.

c. The management arrangements that ensure the surveillance programme provides sufficient lead-time to enable the stockpile to be decommissioned should the surveillance activities reveal that the safe stockpile life is shorter than that anticipated.

d. The management and engineering processes undertaken to assess the safety of the stockpile (for example, during service life assessment), including the derivation of the assessment criteria.

e. The process for reviewing and approving the output from such service life assessments to support the assessment of service life and continued design certification.

f. The process for linking the level of safety assurance provided to the level of positive evidence provided by assurance activities (e.g. the measurement and assessment of properties pertaining to safety significant components defined in the safety case)

g. The arrangements for reporting the outcome of activities such as service life assessment to interested organisations and for seeking an extension to the existing approved service life.

h. The process for reviewing and agreeing any changes to the periodicity and scope of service life assessment activities.

i. The arrangements for dealing with situations where examination, maintenance, inspection and testing reveals faults, or conditions which jeopardise safe operation or indicate a potentially unsafe condition, including the notification of the Defence Nuclear Safety Regulator.

Regulation TC 1 Guidance Note

Transport, Packages and Containers

Introduction

1. This Condition results from the DNSR's role as Defence Competent Authority[10] for the transportation of Radioactive Materials (RAM) in support of the DNE. The purpose of this Condition is to ensure that all RAM Transport activities are carried out in accordance with the extant issue of the UK Legislation, except where specifically agreed with DNSR.

Scope

2. Transport of RAM including but not limited to Special Nuclear Materials, Nuclear Weapons, Nuclear Fuel and Radioactive Waste outside a fixed site in support of the DNE.

3. In this Guidance Note the meaning of 'transport' is as defined in International Atomic Energy Agency (IAEA) 'Regulations for the Safe Transport of Radioactive Material' (SSR-6) (hereafter referred to as the Regulations) paragraph 106 of the Regulations, i.e. 'transport' comprises '*all operations and conditions associated with and involved in the movement of radioactive material; these include the design, manufacture, maintenance and repair of packaging, and the preparation, consigning, loading, carriage including in-transit storage, unloading and receipt at the final destination of loads of RAM and packages'*.

Guidance to Authorisees and duty holders

Competent Authority Approval

4. Competent Authority approval is required for packages[11] as specified in Para 802 of the Regulations. Submissions for such packages should be made 12 months[12] before the intended first use or before the expiry of an extant certificate.

5. In general package approval certificates issued by DNSR will be valid for 5 years, after which a 'Periodic Review' and re-approval by DNSR is required prior to continued use.

[10] Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG 2009) Part 6, 25(3)(b) identifies Secretary of State (Defence) as the Competent Authority for Defence.
[11] Includes but not limited to Type B, Type C, any package including Fissile Material and those requiring Special Arrangements
[12] In accordance with DNSR Guide to an Application for UK Defence Nuclear Programme Competent Authority Approval of a Transport Package for Radioactive Material

Presentation of Safety Cases for Packages

6. Safety cases for packages requiring Competent Authority approval should be presented in accordance with DNSR Guide to an Application for UK Defence Nuclear Programme Competent Authority Approval of a Transport Package for Radioactive Material, which is specifically designed to ensure that all relevant clauses within the Regulations are duly considered.

7. Safety cases of US origin compliant with NRC/Department of Energy requirements may differ in format and presentation to UK safety cases. The requirements for the format of Safety Analysis Reports for Packaging (SARP) are acceptable to DNSR if they adequately address all appropriate issues and contain a 'cross reference' table setting out where in the report each requirement of the regulations is addressed (see the DNSR Applicant's Guide).

Interpretation of the Regulations

8. In interpreting the Regulations and the adequacy of management arrangements, duty holders should take note of:

International Atomic Energy Agency Standards. The most important IAEA Documents are the 'Regulations for the Safe Transport of Radioactive Material', IAEA Safety Standards Series No. SSR-6 and the associated guidance IAEA Specific Safety Guide SSG-26 'Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material'. Other useful IAEA guidance is available through the IAEA website.

Guidance Issued by DNSR, including:

DNSR Guide to an Application for UK Defence Nuclear Programme Competent Authority Approval of a Transport Package for Radioactive Material.

DNSR Technical Assessment Guide 'DNSR Guidance on Radioactive Material Transport Package Assessment', DNSR/TAG/D009 [Contains many additional technical references]. This may be requested from DNSR.

Defence Nuclear Enterprise: Radioactive Material Transport Safety: Incident Reporting Criteria.

Guidance issued by ONR including:

An Applicant's Guide to the Suitability of Elastomeric Seal Materials for Use In Radioactive Material Transport Packages.

A DfT Guide to the Approval of Freight Containers as Type IP-2 and Type IP-3 Packages.

Transporting radioactive material – Guidance on emergency planning and notification for the transport of class 7 goods.

US Guidance

On occasion it may be appropriate to take note of the approaches required and/or recommended by the NRC (in CFR 71 and the NUREGs) when addressing aspects of the design and substantiation of package designs, in particular where the point is not clearly covered by IAEA or UK/EU standards.

Periodic Review

9. Safety cases for 'Periodic Reviews' of packages should generally be presented to the standard required for new packages. This does not preclude justification of transitional arrangements[13] for older designs.

Marking, Labelling, and Placarding: Security Considerations

10. Packages and associated conveyances should normally be marked, labelled, and placarded in accordance with the UK Legislation. Justification to omit any Marking, Labelling and Placarding to improve security should be made to DefNucSyR.

Transport of Radioactive Material within Fixed Authorised Sites

11. Where the transport of RAM within an Authorised site is carried out in a manner that is compliant with the requirements for off-site transport, then DNSR will normally accept that process as being adequately safe without additional evidence. Where on-site transport of RAM is managed in a different manner the arrangements shall provide an ALARP demonstration and shall be justified in an appropriate site safety case.

Emergency Response

12. Consignors and Carriers should have established Emergency Response arrangements in place. In accordance with the latest DNO policies and arrangements this responsibility can be provided by the MoD Transport Nuclear Emergency Organisation.

Additional Guidance on DNSR Requirements

13. DNSR uses internationally accepted standards as expressed in the extant issue of the Regulations issued by the IAEA. Furthermore, DNSR requires duty holders to comply so far as is reasonably practicable with extant UK legislation as if no Defence exemptions exist. Therefore, DNSR is unlikely to accept any management arrangements for the transport of RAM which do not provide that:

a. all transport activities shall be carried out in accordance with the extant issue of the UK Legislation, except where specifically agreed with DNSR;

[13] See IAEA Safety Standards Series No. SSR-6, paragraphs 819 – 823.

b. packages for RAM shall have safety cases which demonstrate compliance with the Regulations as interpreted by DNSR;

c. safety cases for packages containing both Class 7 and Class 1 material (as defined in the Regulations) shall address the possibility of an explosion within the package and to demonstrate compliance with any requirements of DOSR;

d. safety cases for packages containing both fissile material and a substantial quantity of Class 1 material may be assessed by reference to SAP (Part 2 Chapter 2).

14. All packages shall be designed, manufactured, inspected, tested, loaded, and used in accordance with the Regulations, and submissions are to be made to DNSR for those packages for which the Regulations require Competent Authority approval.

15. All Consignors, Carriers and Consignee shall be competent and SQEP to undertake the roles and responsibilities detailed within UK legislation.

Annex B: Guidance on Regulatory Processes and Activities

The Defence Nuclear Safety Regulator

Purpose, Vision and Mission[14]

1. DNSR's vision is "Nuclear capability which is demonstrably safe and available to meet Defence needs" and the purpose is described in the mission statement "To regulate the nuclear hazards of the Defence Nuclear Enterprise, as a trusted independent regulator in Defence". DNSR regulates the NNPP and NWP through all phases of the CADMID[15] cycle.

2. DNSR-Hd is mandated to:

a. set, own and maintain Defence Regulations and regulatory policy where required by SofS Policy;

b. gain assurance about safety and environmental protection by inspection and permissioning of activities, inspection of arrangements, review of safety justifications and assessment of emergency response exercises;

c. provide information about safety and environmental protection by reports, including an annual report, about DNSR's activities and conclusions;

d. assure the Secretary of State (SofS) for Defence about nuclear safety and environmental protection in the DNP.

3. This Annex outlines the regulatory processes and activities which DNSR will use principally in interacting with organisations being regulated. The detailed processes that govern and guide the internal business of DNSR are not included in this Annex. Guidance developed by DNSR for use by Authorisees and other stakeholders is provided in separate Annexes to this document.

Regulatory Policy

4. As identified in DSA01.1 DNSR sets, owns and maintains regulatory policy for, and assurance of, nuclear and radiological safety and environmental protection in the Defence Nuclear Enterprise. DSA02–DNSR sets out the regulatory requirements and DSA03–DNSR provides related guidance.

<u>Defence Nuclear Programme Regulators Forum</u>

5. The Defence Nuclear Programme Regulators Forum (DNPRF), chaired by DNSR-Hd ensures that the Defence Nuclear Programmes are regulated in an informed and coherent manner across the nuclear, maritime and explosive safety domains. The forum seeks to influence future regulatory policy, regulatory models and balance of investment issues, shares relevant safety information across the domains, agrees/directs specific packages of work to resolve emerging pan domain issues, and develops joint regulatory interventions. Meetings are attended by representatives from DNSR, DOSR and DMR, with appropriate SME support as necessary.

<u>DNSR Regulatory Policy Committee (RPC)</u>

[14] DNSR Strategy 2020-2025 November 2019

[15] Smart Acquisition CADMID Cycle: Concept; Assessment; Design; Manufacture; In-service: Disposal.

6. The DNSR Regulatory Policy Committee (RPC), chaired by DNSR-NWR, is responsible for the development of regulatory policy within DNSR, as well as the endorsement of DNSR regulatory documentation. Membership includes DNSR-NWR, DNSR-NPR, staff from the Techical Support organisation and an independent. Terms of reference are available from DNSR.

Regulation

7. DNSR regulates through the application of the DNSR Ten Values[16] and the following processes:

a. the formal declaration of the scope of an Authorisee's activities through an Authorisation Certificate (see paragraph 9 below);

b. the generation of Intervention Strategies (IS) and Intervention Plans (IP) (see paragraph 24 below);

c. inspection of activities and arrangements (e.g. Authorisation Condition (AC) Compliance Inspections and other documentation provided by an Authorisee) (see paragraph 27 below);

d. assessment of safety justifications or submissions which may enable activities to be permissioned or approvals to be agreed (see paragraph 33 below);

e. assessment of emergency response exercises to examine the effectiveness of emergency arrangements in a dynamic environment (see paragraph 57 below);

f. response to events (including incidents and accidents) and the investigation of them (see paragraph 60 below).

8. DNSR provides information on its activities, principally by written reports at various levels, but also in briefings of differing degrees of formality. Each year, DNSR-Hd submits a report for the SoS for defence through the DSA summarising high level conclusions on safety performance in the DNP. DNSR Principal Inspectors produce quarterly reports which are available from DNSR and, where appropriate, are provided to Local Liaison Committees for information.

Authorisation

9. DNSR formally recognises the conduct of most activities in the DNE with nuclear or radiological safety implications through the provision of an Authorisation Certificate specifying the scope of the activities and the location(s) in which they are conducted. The Conditions attached to the Certificate are the Authorisation Conditions (AC), Further Authorisation Conditions (FAC) and Transport Condition.

10. The transport of DNE RAM, other than NW, is regulated in a similar manner to the regulation of civil RAM transport, and is therefore outside the 'DNSR authorisation system'. DNSR regulatory processes and activities in relation to 'non-NW' RAM transport are generally as described in DSA02–DNSR. The requirements against which RAM transport is regulated are those set out in DSA02–DNSR.

11. Authorisees in the DNE are detailed in Table B.1, below.

[16] DNSR's Ten Values are Accountable, Competent, Consistent, Proportionate, Targeted, Informed, Transparent, Joined-up, Timely and Learning.

Scope of Major Defence Nuclear Enterprise Through Life Activities[17]	Naval Nuclear Propulsion Programme	Nuclear Weapon Programme
Design and Approval	**Head of Nuclear Propulsion**	**Director Warhead, DNO**
Construction and first commissioning of naval reactor plant	**MD/BAE Systems Marine Limited**	
R&D, manufacture, assembly/disassembly of nuclear warheads		**MD/Atomic Weapons Establishment plc**
Testing of naval reactor plant	**Naval Superintendant, Vulcan NRTE**	
Logistic transport of nuclear warheads		**Director Warhead, DNO**
Nuclear warhead processing and storage		**Naval Base Commander, HMNB Clyde**
Naval base support and maintenance	**Naval Base Commander, HMNB Clyde** **Naval Base Commander, HMNB Devonport**	
Deep maintenance (including refuelling) of naval reactor plant	**MD Submarines/Devonport Royal Dockyard Limited**	
Operations at sea and alongside operational berths outwith Authorised Sites[18]	**Head of Nuclear Propulsion**	**Chief Strategic Systems Executive**

Table B.1. Authorisees in the DNE

12. Where required, DNSR will regulate all nuclear safety activities and organisations throughout the DNE where activities are not covered by statute.

13. Issue of a Certificate of Nuclear Authorisation is akin to the granting of an Office for Nuclear Regulation (ONR) nuclear site licence. The Certificate of Nuclear Authorisation is issued by DNSR Head and specifies the location and/or scope of activities the Authorisee may undertake, and any applicable caveats. A Certificate of Nuclear Authorisation will remain in force while the Authorisee is conducting the specified nuclear activities and its issue, amendment, transfer or withdrawal will only occur following formal assessment and consultation between DNSR and the Authorisee.

14. The DNSR nominated site inspector will assess the adequacy of the Authorisee's (or prospective Authorisee) arrangements and their compliance based on evidence from assessments, inspections and regulatory interactions. The DNSR Management Board (DNSR MB) will review the inspector's recommendation and make appropriate recommendations to DNSR Head, who may issue a Certificate of Authorisation accordingly.

15. DNSR Head formally Authorises a MOD post holder, designated as Authorisee or the equivalent commercial operating company Director or Managing Director, through the issue of a Certificate of Nuclear Authorisation to an individual post (vice a body or corporate business) who is deemed to be in control of the activities.

16. Before the DNSR Head will grant a Certificate of Nuclear Authorisation, they must be satisfied with the nuclear and radiological safety aspects of the Authorisee's Health, Safety and Environmental Protection (HS&EP) arrangements. This will include the Safety Management Arrangements (SMA) and Safety Management Organisation (SMO), including

[17] A summary of scope is provided; details are in the relevant Authorisation Certificate
[18] Navy Command is the principal duty holder to both NP-Hd and CSSE

its understanding of core capability, intelligent customer and controlling mind concepts and its ability to maintain these within its own organisation. DNSR will consider whether the Authorisation applicant meets the requirements laid down in DSA02–DNSR, and is able to comply with any caveats attached to the Authorisation.

17. Authorisation is granted for an indefinite period and, in principle, one Authorisation could cover the entire lifecycle of the activity. In practice, a replacement, amendment or an update/revision and subsequent up-issue to an extant Certification of Nuclear Authorisation may be required, for example when there is a change to the basis on which the current Authorisation was granted, or a change in Regulatory Policy.

18. A replacement Authorisation may be needed when there is a material change to the basis on which the existing nuclear site Authorisation was granted, that is:

a. If the incumbent Authorisee wishes to carry out an activity which is not covered by its current Authorisation;

b. If the incumbent Authorisee wishes to undergo a significant organisational change (including change of post holder) or change the way in which nuclear activities are to be delivered (such as transfer of activities between Authorisees or to a third party)[19];

c. Where the location boundary is to be extended or changed;

d. Where DNSR initiates a review, consultation and up-issue of a Certificate of Nuclear Authorisation.

19. Authorisation Certificates are not time bound and will require withdrawal at some point in time. This may be when the activity ceases, at some point during the decommissioning process or as a result of transfer to a different regulatory body.

20. Withdrawal of a certificate is usually a bespoke activity and will depend on the rationale for withdrawal however consideration should be given to the following points:

- The Authorisee responsibility continues until such time as DNSR agrees that its Authorisation is ended;
- End of Authorisation could be for part of a site or the whole site;
- End of Authorisation could be for specific activities or part activities (although suspension could be considered here, see below);
- Where a site is being decommissioned, it may be subject to the Environmental Impact Assessment for Decommissioning (EIADR) Regulations;
- The Authorisee shall produce a risk assessment showing that residual risks are As Low As Reasonably Practicable (ALARP);
- The Authorisee shall produce a risk management plan showing that residual risks will be managed adequately going forward;
- Where the risk assessment shows that the ‘no danger’ criteria of NIA 65 are not met or that there remains nuclear or radiological hazards, statutory regulation by

[19] It is of note that extant Authorisees may undertake changes under AC22 or AC36 for example that will not require alterations to their Certificate of Authorisation.

ONR and the Environment Agency (EA) (Scottish Environmental Protection Agency (SEPA)) is likely to continue.

Suspension

21. Withdrawal of Authorisation is a permanent arrangement, there may be times when a more transient arrangement is required as there is an intent to restore the Authorisation at some point in the future. This may be due to a cessation of an activity for a significant time period e.g. from lack of programme demand or there is a requirement to meet modern standards before an activity can recommence from a Periodic Safety Review shortfall for example.

22. Suspension of a certificate is usually a bespoke activity and will depend on the rationale for suspension, however consideration should be given to the following points:

- Suspension of Authorisation implies a transient arrangement, and an intent to restore Authorisation at some point in the future;
- Suspension may be partial or for all activities;
- An Authorisee may request suspension or DNSR may implement a suspension based on continued compliance failure;
- Shutdown of individual activities, plant operation or process may be achieved through enforcement such as Prohibition Notice or AC31;
- Operational Imperative arrangements exist to cater for individual activities undertaken outside the scope of Authorisation without modifying the Authorisation itself;
- As to whether there are any organisational capability failings that impact the scope of the Authorisation and hence the assurance DNSR is able to provide to Secretary of State that MOD safety policy is being met;
- Suspension need not lead to the total cessation of the activities in the scope of Authorisation – to maintain a safe state or storage may require a certificate for example.

23. For withdrawal or suspension of a certificate the DNSR MB will take cognisance of changes of scope in an Authorisee's activities and where appropriate will recommend withdrawal or suspension of Authorisation or transfer of the regulatory vires to another regulator e.g. ONR.

Intervention Strategies and Plans

24. Intervention Strategies (IS) and Intervention Plans (IP) determine the way that DNSR interacts with Authorisees. A programme (e.g. NNPP) level strategy is produced taking account of developments, technical, managerial and contractual in the NNPP. Authorisee specific IS and IP are produced by DNSR to guide regulatory staff in the business of gaining assurance, influencing behaviours and permissioning activities, and to inform Authorisees about what is proposed. IS and IP are tuned to the particular circumstances of an Authorisee taking account of issues such as maturity of arrangements (compliance), the Authorisee's programme of activities, perceived safety risk and regulatory resource. Where DNSR works jointly with another regulator (especially with ONR), integrated, sometimes joint, IS and IP are normally produced.

25. An IS states regulatory priorities over a 3-4 year period, stating the major outcomes expected and requires the production of IP. The following are considered in producing an IS and reviewing it (at least annually):

a. DNSR's business plan and Issues from the previous DNSR Annual Report;

b. The extant DNSR Strategy;

c. the opportunities for different types of intervention;

d. the outcomes from previous interventions;

e. programme information published by the Authorisee and its parent organisation;

f. regulatory analysis of the Authorisee's activities and the risks they present;

g. regulatory view of the state of compliance with AC and associated culture for safety;

h. any Improvement Notice (IN) or Finding requiring long-term action;

i. a strategic view of the regulatory resource to be applied to the Authorisee.

26. An IP scopes the inspection and assessment programmes over the future year, noting the permissions expected to be requested, and explains how the relevant IS will be achieved. The following are considered in producing an IP and reviewing it (approximately quarterly):

a. the relevant IS;

b. the outcomes from previous interventions (in year);

c. short-term changes in the Authorisee's programme;

d. any enforcement action;

e. short-term information on the regulatory resource to be applied.

Inspections

27. A programme of inspections is agreed with each Authorisee to meet objectives in the relevant IP. The programme is reviewed approximately quarterly altering in the light of emerging issues or events. The IP should provide a balance of compliance inspections, themed inspections and System Based Inspections (SBI) and include inspections of:

a. Individual ACs/FACs and TC: To determine the adequacy of safety management arrangements and their implementation. A summary of DNSR's view of an Authorisee's compliance with ACs is prepared in support of high-level meetings between DNSR-Hd and the Authorisee (approximately annually).

b. Themed, e.g. groups of Conditions associated with an activity. For example compliance with ACs 13, 14 and 15 may be associated with the theme of control of safety cases and could be applied across a range of Authorisees. The effectiveness of Leadership and Management for Safety may be inspected via the use of a themed inspection of appropriate ACs.

c. Specific facilities, or areas within a facility e.g. a physical area where an activity is undertaken: Such an inspection may be appropriate in support of permissioning decisions or if there are emergent safety issues associated with an activity but the root cause has not been identified and is not readily attributable to shortcomings in compliance with a particular AC, FAC or TC.

d. Operational Readiness Inspections: Conducted to release a defined scope of activities which are bounded by a Hold Point Expectation Document. The scope of an ORI is to be proportionate to the risk and the maturity of the Authorisee's arrangements.

e. System Based Inspections: Targeted at key Structures, Systems and Components (SSC) in order to verify that adequate measures are in place (people, plant and processes) to implement the safety case and the SSC will deliver its Safety Functional Requirements on demand. SBI may be cross cutting and consider several ACs as part of the inspection.

f. Inspections conducted to assess maintenance of design intent: Consideration of through-life safety throughout the CADMID life cycle.

g. Reactive Inspections: When necessary, a reactive inspection may be conducted in response to an event which appears to require specific regulatory action and/or an investigation. While notice is normally given, in exceptional circumstances an immediate, unplanned inspection may be carried out.

h. Large Scale Inspections: A large scale inspection may be conducted when, for example, it appears necessary to undertake a holistic or high-level review of an Authorisee's management arrangements in a way which routine inspections do not.

i. Authorisation Inspections: A potential Authorisee or an Authorisee is subject to one or more routine inspections and/or a large scale inspection to establish or re-establish the basis for Authorisation.

28. In preparing the IP, an Inspector will consider whether a given inspection is to be planned or unannounced and who will be involved in its undertaking (i.e. an individual Inspector or team of Inspectors, technical assessors, Inspectors from other regulatory bodies, observers, Authorisee representatives etc.).

Inspection Process

29. DNSR Inspectors will work together with other regulators where appropriate to co-ordinate inspection programmes in the interests of efficiency. Before an inspection, the DNSR Inspector will consult with the Authorisee to be inspected to agree the detail of the inspection arrangements. In the interests of efficiency and practicality, occasions may arise when DNSR Inspectors may wish to observe or participate in an Authorisee's internal inspections. On request an Authorisee is to make the outcome of relevant internal inspections available to DNSR. The inspection team may be led by either senior DNSR personnel or other regulatory bodies and may also be performed jointly with those bodies.

30. DNSR will utilise the services of technical support organisations (TSO) as described by IAEA TECDOC 1835 during inspection activities on Authorised and duty holder sites as required, and as such will require access to facilities and personnel for inspection purposes, meetings and regulatory interventions. In such instances TSO support will possess the required security clearance required for site or facility access and will undergo such induction or safety training as is necessary to allow unescorted movement.

31. Inspections are conducted against the relevant documentation covering the scope of the arrangements and activities being inspected (e.g. statutory requirements, appropriate elements of DSA02/03–DNSR, Authorisation Condition compliance evidence, Safety Assessment Principles (SAP), safety justifications). On request, an Authorisee is to make the outcome of relevant internal inspections available to DNSR Inspectors.

32. At the conclusion of an inspection a closing meeting is held with representatives of the Authorisee so that key issues can be presented. Subsequently, a written report is provided which expands on the material presented at the meeting and proposes any Corrective Actions Requirements (CARs), together with any Recommendations and Observations. Any subsequent Enforcement is undertaken in line with DSA02–DNSR.

Permissioning

33. In common with statutory regulators, DNSR operates a permissioning regime which requires Authorisees to seek regulatory permission before conducting specified activities; the elements of this regime (and the language of consents, approvals and agreements) are expounded in AC, FAC, or TC where appropriate. DNSR also requires Approving Authorities (as part of the MOD Design Authority Function) to obtain regulatory permission prior to granting Authority to Operate[20] by Authorisees. Permissioning is granted subject to the assessment of safety justifications or submissions together, where necessary, with the outcome of inspections of arrangements and/or activities which are aimed at gathering objective evidence of adequacy of, and compliance with arrangements.

34. Safety management arrangements require classification schemes which govern due process within an Authorisee's organisation, potentially including the regulator for higher significance activities or approvals. DNSR may also "call in" the justification or submission for lower significance activities or approvals and is notified about the business of an Authorisee's Nuclear Safety Committee.

35. Relevant AC, FAC and TC require that justifications and approvals are prepared in stages; for example a justification may be progressively prepared as the design of a new facility is developed. Authorisees and Approving Authorities are encouraged to engage early in any justification or approval campaign and to propose hold-points from which DNSR can select those significant enough to warrant regulatory intervention and agree the associated

[20] Some Authorisees use the term 'Approval for Use' rather than 'Authority to Operate'.

hold point release criteria. If necessary DNSR will introduce specific regulatory hold points. A programme is then developed which allows sufficient time for DNSR to undertake assessments and provide the necessary permissions or agreements to meet declared milestones. Likewise, subsequent changes to people, plant or processes may also require DNSR permissioning, depending on the safety classification.

36. For justifications and approvals, DNSR permissioning can either be via the primary powers in the relevant Condition, or via derived powers built into the Authorisee's arrangements:

> **Primary:** These are the powers that DNSR can use that derive from the Authorisation Conditions themselves, for instance, the power to direct an Authorisee to do something (e.g.to submit such documentation as DNSR may specify), or the power to Direct the Authorisee to halt decommissioning of nuclear plant. The Authorisation Conditions provide six primary powers comprising "Consent", "Approval", "Direction", "Notification", "Specification", and "Agreement".
>
> **Derived**: These are powers granted to DNSR through the Authorisee's arrangements made to satisfy certain Authorisation Conditions, for instance powers to permission selected activities through the identification of hold points. They are also known as secondary powers.

37. Authorisee arrangements may grant DNSR derived powers as appropriate. For example, an Authorisee may wish DNSR to agree to the lifting of a internally defined hold point as a derived power, as opposed to DNSR specifying a regulatory hold point as a primary power beyond an existing set of Authorisee defined hold points.

38. The depth and scope of scrutiny during regulatory assessment is at DNSR's discretion taking into account issues such as:

a. the probability and potential consequences of a nuclear emergency including malicious acts;
b. the provenance of the design and safety justification;
c. the robustness of the Authorisee's arrangements.

39. The regulatory assessment seeks:

a. evidence of compliance with Defence Regulations;
b. to establish that risks to workforce and public are demonstrated to be ALARP;
c. evidence of the use of appropriate codes, standards and methods;
d. assurance that the Authorisee's own assessment and due process has been adequate.

40. In conducting regulatory assessment, DNSR Inspectors (and assessors) are guided by ONR's SAP, DNSR and ONR relevant Technical Assessment Guides (TAG) and other appropriate national and international guidance (e.g. from the International Atomic Energy Agency (IAEA)).

41. DNSR's permission is indicated by letter or certificate as appropriate; issues affecting nuclear safety or radiological or environmental protection may be associated and managed in line with the DNSR enforcement model. DNSR may revoke, revise, or withdraw any permission if the circumstances so demand it. The process for permissioning of activities is shown at Figure B.1, below:-

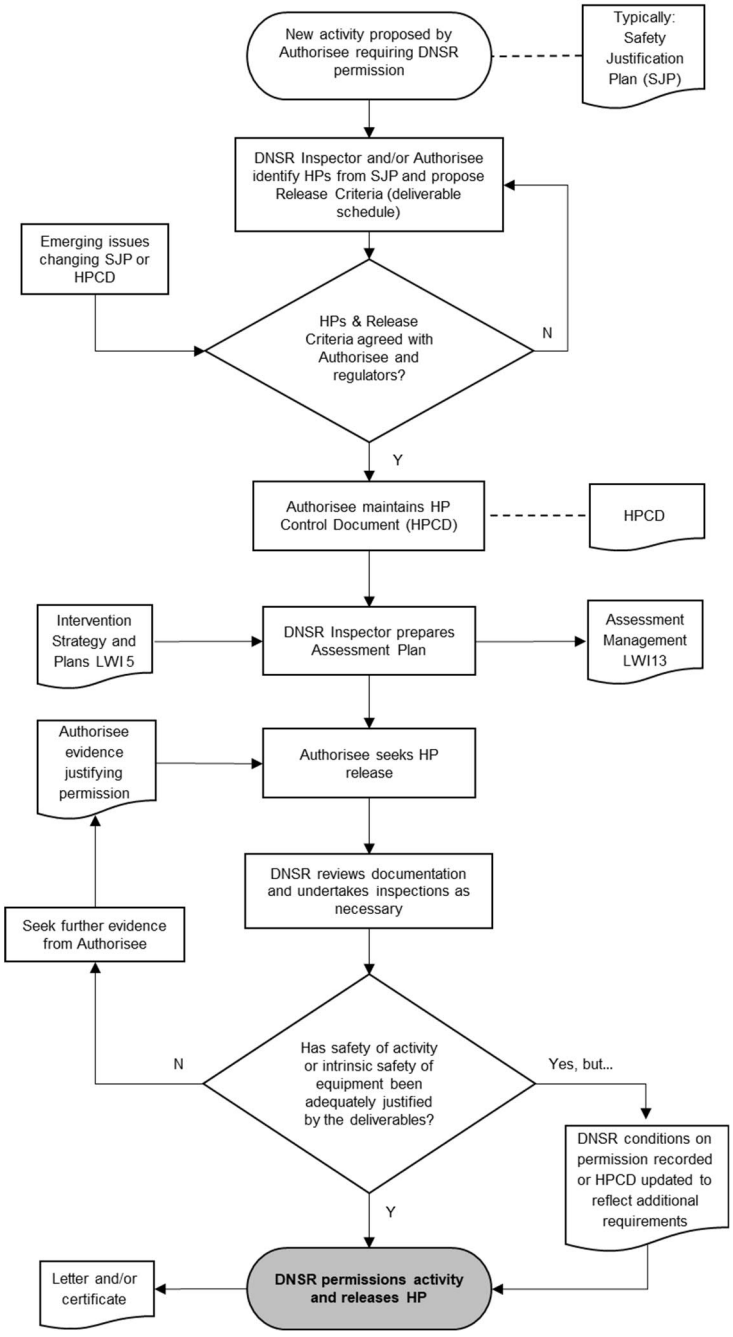

Figure B.1 Permissioning Process

Regulatory Enforcement

42. DNSR's process for the management of issues is risk based, graduated and escalatory, communicating clearly to an Authorisee the status, importance and urgency of an issue which

DNSR considers to have an impact on safety and facilitating its efficient resolution, as agreed with the Authorisee.

43. Most enforcement action will arise from inspection, assessment or contact with the Authorisee, and will use the DNSR enforcement process, which aligns with the enforcement models of the Defence Safety Authority (DSA), Office for Nuclear Regulation (ONR) and Health and Safety Executive (HSE).

44. There are many variables in potential enforcement scenarios. However, the process provides a structured approach that will assist in ensuring targeted, proportionate, accountable, transparent and consistent decision making.

45. The DNSR enforcement process comprises the following steps:

- Consider Prohibit Notice;
- Assess the risk/compliance gap;
- Determine initial enforcement expectation, taking cognisance of the risk and compliance gap;
- Apply Authorisee Considerations;
- Apply Strategic Considerations;
- Determine enforcement action in consultation with DNSR management as appropriate;
- Issue enforcement action;
- Review, escalate, elevate as appropriate.

46. If the Authorisee acts promptly and effectively to restore compliance and adequately safe operations, then the Inspector should consider mitigating the enforcement, e.g. from Improvement Notice to CAR, or from Prohibit Notice to Improvement Notice.

47. Where a non-compliance with their own arrangements does not breach Defence Regulations, and where the non-compliance does not undermine the intent of the arrangement, then an Inspector may moderate the CAR down to a Recommendation.

48. If for any of the following considerations the answer is yes, then the Inspector should consider escalating the enforcement, e.g. from Recommendation to CAR, or from CAR to Improvement Notice:

a. Is there a history of related incidents, or evidence of related incidents?

b. Does the Authorisee have a history of relevant enforcement being taken against them for similar issues by verbal warning, letter, or formal enforcement?

c. Is the failure to comply commercially motivated?

d. Has a serious personal injury or serious health issue already occurred as a result of the matter under consideration?

e. Does the Authorisee have an inspection history of significant problems, copious advice and poor inspection ratings?

f. Is there a failure of compliance across a range of inspections, i.e. are the majority of issues not adequately addressed? Would the objective evidence of non-compliance stand up to subsequent scrutiny against legal or regulatory requirements or guidance (e.g. as provided by SAPs)?

g. Is there a concern that the Authorisee does not have the capability or commitment to comply with the Defence Regulations and ensure the effective management of safety?

49. There is also a range of Strategic Considerations which DNSR may consider as part of the decision making process, but do not determine the decision. These considerations are not to be confused with strategic imperatives. Enforcement action may need to be considered against the wider objectives and priorities of DNSR, to ensure that safety is best-served across the DNE.

Appeals against enforcement decisions

50. There may be occasions where the Authorisee does not agree with enforcement action being taken by a Regulator, either on the basis of the evidence used or the process followed. If so:

a. The Authorisee should raise a formal appeal in writing with the Regulator, usually within 14 days of the enforcement notice being served. DNSR-Hd will review the appeal and respond within 30 days of the appeal being received;

b. The Authorisee may escalate the appeal up their command/management chain to appeal to DG DSA. In such cases, the appeal should be raised in writing within 30 days of the response to the original appeal. DG DSA should review the appeal and respond within 30 days of the appeal being received. Should the Authorisee still not be satisfied following appeal to DG DSA, they may submit an appeal to SofS, whose decision will be final;

c. In the case of an appeal against a Prohibit Notice, the requirement to cease activity remains extant while the appeal is being considered, unless an operational imperative exists.

Regulatory Agreement to Criticality of Naval Reactor Plant

51. For a Naval Reactor Plant (NRP) to be operated, formal regulatory agreement is necessary. Normally this will be in the form of DNSR agreement to the issue of an Authorisation to Operate (AtO) by the Naval Reactor Plant Authorisee (NRPA); the agreement will outline any conditions and limits, including limits on duration.

52. For initial criticality of a new core for Active Commissioning by Power Range Testing (PRT) there will normally be discrete elements of regulatory process:

a. DNSR (normally Principal Inspector Operational Reactors) will agree to the issue of the AtO (PRT) by the NRPA when satisfied that the NRP and its supporting documentation are in an adequate state following inactive commissioning;

b. DNSR (normally Principal Inspector for the site), in conjunction with the Office for Nuclear Regulation (ONR) where appropriate, will permission the conduct of PRT on an

Authorised site when satisfied that the Authorisee's relevant arrangements and facilities are adequate.

53. On satisfactory completion and adequate assessment of PRT and when satisfied that continued operation of the NRP can be supported, DNSR will agree to the issue of the AtO(Fleet) by NRPA.

54. As long as there is a valid AtO, DNSR will not normally need to agree an individual NRP start up. There are, however, exceptions:

a. where the possibility arises that the NRP may need to operate outside the conditions and limits of the AtO (e.g. due to a defect or emergent issue): a suitably robust ALARP justification (commensurate with the extent to which the conditions and limits may be breached) would need to be provided by NRPA before DNSR permission could be given. The justification will need to address the particular issues affecting the NRP, present optioneering to identify mitigating actions, and identify the benefit that will accrue from continued operation. It may be necessary to review the state of the NRP against the requirements of Radiation (Emergency Preparedness and Public Information) Regulations (REPPIR) where there is doubt over compliance with the submissions to ONR or a material change is indicated;

b. where a deviation from the permissioned activity is proposed; this is particularly the case if trials are to be planned that have a material implication for the safety of the workforce or the public or protection of the environment;

c. where a formal regulatory hold point has been placed.

55. Briefing of Ministers and senior officials will be conducted as appropriate to the plant in question and the situation prevailing at the time, noting the routine briefings by NRPA in support of PRT.

Radioactive Material (RAM) Transport

56. DNSR is the Competent Authority for the transport of radioactive material within the DNP. Applications for package (and where appropriate shipment) approval are made to the Competent Authority. Potential Applicants should read the 'DNSR Guide to an Application for UK Defence Nuclear Programme Competent Authority Approval of a Transport Package for Radioactive Material'. DNSR Inspectors are guided by a DNSR TAG, Special Nuclear Material Requirements (SNMRs), ONR TAGs and other appropriate national and international guidance.

Emergency Response Demonstration

57. The response to an emergency is a dynamic activity; assurance that an Authorisee's arrangements are adequate is most satisfactorily gained when the response is demonstrated under simulated conditions in exercises. Not all elements of a specific emergency response (e.g. an Authorisee's on-site plan) need to be demonstrated in a single exercise, but DNSR expects an Authorisee to propose a programme of exercises over a period which will address all elements. In addition to routine inspection of management arrangements, DNSR assesses emergency response demonstration exercises in the Defence Nuclear Programme working jointly, when appropriate, with ONR which has statutory regulatory responsibilities for emergency response under Radiation Emergency Preparedness and Public Information Regulations (REPPIR). JSP 471 states Departmental policy for defence nuclear emergency response; DNSR works in conformance with that policy.

58. The scope and scenario of an adequate demonstration exercise is proposed in advance by an Authorisee and agreed by the DNSR Inspector. The Authorisee plans the exercise, giving the DNSR Inspector visibility of the process, and provides a briefing for the assessors just prior to the exercise. The Authorisee may also conduct self-assessment of the demonstration. The DNSR assessment is conducted by a team who will observe each key area of the response. Observations are made systematically on as objective a basis as possible against common guidelines; they cover the way the exercise has been planned and is controlled as well as the response itself. The assessment focuses on the outcomes that are required, checking that the response plan describes how they should be achieved, but giving credit for achieving the right outcomes by means other than those identified. The lead DNSR assessor provides a preliminary verbal report shortly after the exercise has concluded summarising the key outcomes. A letter of assessment follows and where necessary any regulatory issues are managed in line with the DNSR Enforcement model.

59. The assessment is of an Authorisee's response and does not extend to other statutory authorities that may form part of overall response. In view of their major role, however, it is recognised that any shortcomings in the response by statutory authorities may impact on the achievement of particular outcomes. Where such difficulties arise DNSR seeks to establish that all necessary information and advice had been provided to the statutory authorities in advance to enable them to develop their plans effectively, and that appropriate support was provided to the response during the exercise.

Events (Incidents & Emergencies)

<u>Reporting an Event (Incident)</u>

60. AC7 requires an Authorisee to have arrangements for the notification of events[21] (incidents); they cover notification within its own organisation, to other Authorisees, to an Approving Authority and to relevant regulators. The primary reporting point should be the DNSR Inspector; detailed arrangements are promulgated in a protocol document agreed by the Authorisee and DNSR-Hd. DNSR may specify the nature of events which are to be reported to DNSR if they occur. If certain criteria are met, it is a Departmental requirement that an Authorisee notify MOD HQ for defence ministers and that DNSR also provides information about the event (incident).

[21] A plethora of terms may be used in this context (occurrence, abnormal event, event, incident, accident, emergency etc.); a distinction is made here only between incidents and accidents – the latter require activation of emergency response plans.

Early Action

61. DNSR considers the information provided in the notification, against the background of what is already known about the Authorisee's arrangements and activities and in conjunction with other relevant regulators, seeking to understand:

a. whether actual harm (and its degree) has occurred or what the potential for such harm was;

b. whether there is likely to have been a breach of statutory requirements;

c. whether there has been a release of radioactive material;

d. whether (and to what degree) the requirements of the safety justification have been breached;

e. the wider (including public) interest in the event;

f. the potential implications for other activities in the Defence Nuclear Programme.

62. Based on that understanding, DNSR may take early action in accordance with the DNSR Enforcement Model and may initiate a reactive inspection and/or may initiate a regulatory investigation.

Investigation

63. AC7 also requires an Authorisee to investigate events (incidents and accidents) seeking assistance from others (e.g. an Approving Authority) as required. DNSR monitors the investigation conducted by an Authorisee and may undertake a regulatory investigation in conjunction with other regulators (as appropriate) and including a reactive inspection as necessary. Investigations establish the cause of the event and recommend any remedial activity. DNSR may take action in accordance with the DNSR Enforcement model and may specify actions to be taken by other Authorisees and/or Approving Authorities as necessary.

DNSR Response to a Defence Nuclear Emergency

64. Defence Nuclear Emergency Response Arrangements are invoked if an Authorisee has to activate either its operator's or off-site plans. In the response to a defence nuclear emergency, DNSR adapts working practices to the circumstances but does not cease to regulate. In due course, as determined by DNSR, routine regulatory processes are reinstated and preparations made for the investigation (see paragraph 63 above).

65. Where appropriate DNSR staff attend the Technical Guidance Group in order to oversee the technical assessment process, in particular in order to make an independent regulatory assessment of the future course of the emergency. This will be forwarded to the other DNSR regulators described below for input on-site and at both the local and national strategic level of the response.

66. The relevant DNSR Principal Inspector (and other DNSR staff to provide sustainability) attends the emergency location and associated command and control centres in order to:

a. provide regulatory input (including permissioning if appropriate);

b. provide a direct feed of information to the Head of Nuclear Safety Cell;

c. liaise with other regulators present (e.g. ONR);

d. record information on developments and decisions;

e. glean information in support of the subsequent investigation.

67. Where appropriate DNSR staff attend the multi-agency off-site response centre specifically in order to provide an independent regulatory assessment of the future course of the emergency.

68. MOD establishes HQ Nuclear Emergency Response Organisation (NERO) in the Defence Crisis Management Centre in Main Building to provide a link between the Military/MOD Coordinating Authority and MOD HQ (including ministers). HQ NERO also provides the Lead Government Department co-ordination of UK government response. DNSR-Hd becomes Head of the Nuclear Safety Cell (part of HQ NERO), and senior DNSR personnel ensure the sustainability of this cell. DNSR interprets information on the defence nuclear asset involved, assesses the significance of the emergency against the International Nuclear Events Scale (INES) and reviews proposals for stabilisation and recovery (if appropriate). DNSR considers the need for regulatory action in accordance with the arrangements.

DNSR Reports

Visit Records

69. DNSR Inspectors keep a record of regulatory visits or interactions; records of meetings attended with an Authorisee may constitute such records. As a minimum these records include adequate information to support the production of the Quarterly Reports and provide an auditable trail of decision making.

Quarterly Reports

70. DNSR Inspectors produce quarterly reports to provide DNSR-Hd with assurance that the DNE is being regulated in a competent and consistent manner and that progress is being made against the relevant Intervention Strategy, Intervention Plan and the DNSR Annual Report. The reports are compiled to a set format covering interactions with the Authorisee over the previous period and include general statements on the adequacy of Authorisee arrangements, not specific critiques. DNSR may elect to discuss the content of Quarterly Reports with Authorisees at appropriate L3/L2 fora.

71. If the Authorisee provides a forum for representation of local community interests through a Local Liaison Committee (LLC) (e.g. at major sites), DNSR will provide information from the Quarterly Report for the Authorisee to forward to LLC members as appropriate.

DNSR Annual Report

72. DNSR publishes a formal annual report which provides a statement of high-level conclusions about nuclear and radiological safety; environmental protection in the DNE is included. DNSR raises or carries forward issues[22], particularly of a generic nature, to which Authorisees or their parent organisations are expected to respond. The issues result from the regulatory processes and other information provided to DNSR; any IN or CAR

[22] NB. These are not the same as regulatory issues described in paragraph 36 et seq.

promulgated during the year is noted. The report also includes a summary of DNSR's regulatory activities during the year.

Relationship with Other Regulators

73. DNSR liaises and works closely with other Defence Regulators grouped within DSA with common interests. Principally these are the Defence Maritime Regulator (DMR) and the Defence Ordnance Munitions and Explosives Safety Regulator (DOSR). One aim is to align regulatory policy and processes and assessment effort for efficiency and to minimise impact on operators. However, the minimisation of risk of operation of platforms where multiple hazards are present is a more significant long term aim, facilitated by the formation of the DSA.

74. Outside the DSA DNSR works closely with the Defence Nuclear Security Regulator (DefNucSyR) on matters where nuclear safety and nuclear security in the DNE converge.

75. The principal interface which DNSR has with any other regulator is with ONR. The MOD/HSE Agreement describes the overall working relationships between the MOD and ONR. DNSR works closely with ONR in a process of joined-up regulation of relevant areas to minimise the impact on operators and ensure, so far as is practicable, that they are not subject to differing requirements or processes. ONR looks to DNSR-NPR as the "Competent Authority" in respect of Naval Reactor Plant design. Similarly, ONR looks to DNSR-NWR as the "Competent Authority" in respect of nuclear weapon design. Both DNSR-NPR and DNSR-NWR provides ONR with any clarification it requires on hazards arising therefrom. ONR will not seek to influence naval reactor design or nuclear weapon design. A 'Letter of Understanding' (LoU) between DNSR and ONR captures the working relationship.

76. ONR has its regulatory duties defined through statute while DNSR duties are founded on MOD policy partly in response to exemptions from statute and SofS's wider responsibilities. ONR's legal responsibilities require it to regulate compliance with regulations subordinate to HSWA from which there are no MOD exemptions. These include the Ionising Radiations Regulations (IRR) and the Radiation (Emergency Preparedness & Public Information) Regulations. ONR does not regulate compliance with the Nuclear Installations Act (NIA) when MOD is in control. Authorisation covers the range of defence activities that are outside the NIA, activities which would be licenseable outside of Crown control, but also activities where exemptions apply.

77. Regulation of the DNE is most effectively achieved by DNSR and ONR operating a system that ensures complete and seamless oversight of all DNE activities. In some cases joint regulation occurs but generally ONR and DNSR gain assurance from the other's activities. The DNSR/ONR relationship is formally monitored through routine bipartite meetings to monitor adherence to the spirit of the LoU.

78. The ONR process of regulation and enforcement against LC is mirrored by the DNSR process of Authorisation against AC. If a site is both Licensed and Authorised, the same compliance statements should satisfy both regulators where the LC and AC are identical. Similarly the process of regulatory inspection of Licensee/Authorisee and the assessment of its safety documentation may be undertaken in a joined-up manner by ONR and DNSR to ensure a common regulatory response and approach.

79. DNSR's responsibility for the regulation of some radioactive discharges means that it also has interfaces with environmental regulators, the Environment Agency (EA) in England and the Scottish Environment Protection Agency (SEPA) in Scotland. DNSR is the sole regulator for:

a. liquid and gaseous radioactive discharges while at sea;

b. gaseous radioactive discharges while the NPW is alongside.

80. In keeping with SoS's policy declaration of equivalence with civil standards where reasonably practicable, DNSR regulates these discharges in keeping with the principles applied by the environmental regulators, and agrees appropriate levels with the EA/SEPA.

81. The safety management arrangements for liquid discharges alongside NNPP sites and berths are regulated by ONR, with DNSR assistance, under the auspices of the IRR, and any subsequent environmental discharges are regulated directly by the appropriate environmental agencies. The respective regulatory responsibilities may be summarised as follows:

a. Radioactive discharges from defence-related Licensed sites and Authorised sites:

(1) the discharges are regulated by EA/SEPA. (NB The discharges may include radioactive material originating on-board NPWs and transferred ashore for processing);

(2) EA/SEPA also regulate the associated radioactive waste management arrangements from an environmental protection perspective;

(3) For Authorised sites, DNSR regulates the associated radioactive waste management arrangements from a nuclear safety perspective;

(4) ONR regulates the associated radioactive waste management arrangements from a health and safety perspective in line with ONR guidance and Joint Guidance shared by EA, SEPA and ONR.

b. Radioactive discharges from NPWs directly to the environment:

(1) the discharges (comprising gaseous discharges alongside and liquid and gaseous discharges at sea) and the associated radioactive waste management arrangements from both environmental protection and nuclear safety perspectives are regulated by DNSR;

(2) in keeping with SofS's policy commitment so far as reasonably practicable to operate to standards equivalent to those applied by the civil regulators, this DNSR regulation is in accordance with the regulatory principles adopted by EA/SEPA and DNSR liaises closely with the civil regulators on their application;

(3) ONR regulates the associated radioactive waste management arrangements from a health and safety perspective, principally in accordance with IRR17 requirements.

82. The relationship between DNSR and EA/SEPA is one of interfaces; there is not the same overlap of responsibilities as with ONR. It should be noted that:

a. the environmental regulators operate a more prescriptive regime based on limits than the nuclear safety regulators, though legally, the ALARP requirement applies to environmental discharges as well as nuclear safety;

b. NNPP discharges, both from shore establishments and from NPWs, are very small in absolute and relative (to nuclear industry generally) terms.

83. DNSR is the Competent Authority for transport packages in the DNE and interfaces as necessary with ONR's Radioactive Materials Transport Team, the Department for Transport (DfT), and other government departments.

Annex C: Guidance on Other Related Specific Topics, for Authorisees and duty holders

1. Below is a list of guidance on specific topics provided by DNSR, for Authorisees and duty holders:

DNSR Guide to an Application for UK Defence Nuclear Programme Competent Authority Approval of a Transport Package for Radioactive Material (IAEA 2009 & 2012 Regulations), Issue 19, dated April 2013.

Annex D: Guidance on the Use of Relevant Good Practice

1. The Secretary of State (SoS) policy on Health, Safety and Environmental Protection (HS&EP) in Defence requires that: 'In circumstances where the nature of Defence and Security activities inevitably conflict with health and safety requirements and thus Defence has Derogations, Exemptions, or Dis-applications from HS&EP legislation, or where other circumstances indicate the need for Defence regulation of activities, we maintain Departmental arrangements that produce outcomes that are, so far as reasonably practicable, at least as good as those required by UK legislation.'

2. SofS's policy requires that 'we minimise work-related fatalities, injuries, ill-health and adverse effects on the environment and we reduce health and safety risks so that they are as low as reasonably practicable (ALARP)'.

3. This basic requirement is reflected in the SoS policy for HS&EP (even where exemptions apply) and is reinforced through DSA01.1 (The Defence Policy for Health Safety and Environmental Protection) and its direction on the application of risk managed to ALARP. Each Authorisee and duty holder is required to develop and maintain adequate safety management arrangements compliant with the requirements set out in DSA02–DNSR and SofS's Policy Statement as amplified in DSA01.1.

4. The accepted definition of 'reasonably practicable' (as stated in DSA01.1) is: "Reasonably practicable is a narrower term than 'physically possible'....a computation must be made by the owner in which the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) is placed in the other, and that, if it be shown that there is a gross disproportion between them - the risk being insignificant in relation to the sacrifice - the defendants discharge the onus on them".[23]

5. The onus is therefore on the duty holder to demonstrate it has taken all reasonably practicable measures to reduce risk. In judging what risk reduction measures may be reasonably practicable in a given situation, the starting point for duty holders – and the benchmark for regulators – is those measures that have been accepted and established as good practice elsewhere. The HSE in its guidance on ALARP defines RGP as 'those standards for controlling risk which have been judged and recognised by HSE as satisfying the law when applied to a particular relevant case in an appropriate manner'.[24]

6. RGP is not the law: it is a regulatory concept (not specific to nuclear) that provides a practical mechanism for day-to-day judgements on what would usually be considered to meet the legal requirements based on what has been judged and accepted in similar circumstances. If the same standards of safety (reflecting back on SoS policy) can be demonstrated to be achieved through different means then this would also comply with the law.

7. The use of RGP in demonstrating risks have been reduced ALARP can be straightforward in simple, common situations. However, for more complex, high risk activities, or where the circumstances are not fully within the scope of the good practice, additional measures may be required to reduce risks ALARP. The arguments and evidence supporting the ALARP justifications, including why the good practice being claimed is relevant to the undertaking, should, of course, be included within the safety case.

[23] Edwards v. National Coal Board, 1949.

[24] RGP does not have a legal basis, except in the case of Approved Codes of Practice (ACOP), which have a special legal status: Following the advice in an ACOP, on the specific matters on which it gives advice, is enough to comply with the law.

8. A common practice in the DNE or wider industry may not necessarily be good practice or reduce risks ALARP, and duty holders should not assume that this is the case. Regulators and duty holders must keep their understanding of good practice under review since it may cease to be relevant with the passage of time; new legislation may make it no longer acceptable; new technology may make a higher standard reasonably practicable.

9. Authorisee's Safety Management Arrangements should incorporate what it considers and judges to be RGP in order to be able to demonstrate ALARP. Whilst alternative approaches that demonstrably achieve the same standards of safety are acceptable, there is a hierarchy of significance for RGP based on its formal status and pedigree (e.g. the extent of wider industry review), which the regulator will take into account in making its regulatory judgements. Accordingly, an Authorisee's SMAs will not, in themselves, be taken to be RGP; they are the Authorisee's arrangements, its own 'rule set'. Furthermore, whilst SMAs may have been based on the RGP available at the time of their derivation, it is important to recognise that good practice evolves.

10. The International Nuclear Safety Group (INSAG) is convened under the auspices of the IAEA with the objective to provide authoritative advice and guidance on nuclear safety approaches, policies and principles. In particular, INSAG provides recommendations and opinions on current and emerging nuclear safety issues to the IAEA, the nuclear community and the public in INSAG Series Reports. Authorisees are encouraged to utilise these valuable sources of good practice.

11. In the UK, the Safety Directors' Forum (SDF) has a strong focus on improvement across the industry and has representation from both civil and defence nuclear operators and regulators. DNSR encourages active engagement with the SDF as a means of sharing current nuclear industry safety best practice and relevant Operational Experience.

12. The SDF comprises a number of subject-specific sub-groups looking in detail at issues such as radiological protection, human performance, learning from experience and independent oversight, among others. Such sub-groups have developed a number of Good Practice Guides which have been adopted, and are suitable for adoption by the civil and defence nuclear industry.

Annex E: Guidance on the Application of ALARP, Tolerability of risk and 'Defence Imperatives' in the Defence Nuclear Environment

1. Before exposing an individual to a risk, a judgement is required by an Authorisee on whether the risk is managed to ALARP and the risk exposure is Tolerable.

2. It is the level of residual risk exposure that determines whether a Defence Imperative is necessarily deployed to proceed with the activity.

3. **ALARP:** The reduction of risk So Far As Is Reasonably Practicable (SFAIRP) when carrying out any planned activity is a tried and tested legal requirement based on precedent. This requirement is equally interpreted as achievement of risk which is As Low As Reasonably Practicable (ALARP). Although MoD has certain exemptions to statute, in application of ALARP there is no exemption. This can be taken as:

> ***There is no situation in Defence where the Authorisee's demonstration that risk has been managed to ALARP does not apply.***
>
> ***'Imperative' arguments do <u>not</u> over-ride the legal and MoD policy requirements to demonstrate risk is managed to ALARP.***

4. Any exposure of society or particular groups to ionising radiations, or risk thereof, is considered detrimental. A safety justification must demonstrate that there is some benefit in the proposed plant or operation sufficient to offset the detriment.

5. The goal of risk management is to show that safety risks are ALARP and can be tolerated. The law requires that risk has to be weighed against measures necessary to eliminate or reduce the risk, and the more significant the risk, the less weight will be given to the level of sacrifice to achieve that improvement. This balance is summarised by legal precedent:

> *As Low As Reasonably Practicable…..a computation must be made by the owner in which the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) is placed in the other, and if it be shown that there is a gross disproportion between them – the risk benefit being insignificant in relation to the sacrifice – the defendant discharges the onus on them.*

6. An ALARP argument must balance the 'sacrifice' (in time, money or trouble) of possible further risk reduction measures against their expected safety benefit (incremental reduction in risk exposure). The balance must be weighted in favour of safety with a greater 'gross disproportion factor' for higher levels of risk and higher consequence. Through precedent, it is accepted that application of Relevant Good Practice is an essential foundation of ALARP.

7. **Tolerability:** <u>Once</u> a risk has been reduced to ALARP, the Authorisee must balance <u>the residual risk</u> against the expected benefit to determine whether the risk is Tolerable. The Authorisee must be aware of how much risk it can accept and when to elevate risk decisions to a higher level. It is generally accepted that;

*"*Tolerability refers to a willingness to live with a risk so as to secure certain benefits and in the confidence that it *(the risk)* is being properly controlled*".*

8. Given the unique nature of, and unavoidable hazards associated with Defence Nuclear Enterprise activity the residual risk exposure can only be fully understood once the principle of managing risks to ALARP has been applied. Authorisees are to ensure that the residual risk exposure is tolerable to the defence benefit. It will be noted that what is considered 'Tolerable' in one scenario does not necessarily apply to another. A residual risk that, when balanced against an urgent operational need is considered Tolerable, is not necessarily Tolerable when balanced against a need that is less urgent.

9. With the exception of legal limits for radiological dose derived from Ionising Radiation Regulations, all other risk targets or limits of tolerability are policy guidance for duty holders and Regulators alike, they are not mandatory. Nevertheless, since the risk targets are established at practicably achievable levels, failing to meet them is a strong indicator that the level of risk may not be ALARP. It is for the Authorisee to determine the appropriate and applicable risk targets to be used (a numerical BSO and BSL can be used to define).

10. To be clear and in summary, demonstration of risk to **ALARP is a legal obligation, tolerability is not**.

Regulatory Treatment of Defence Imperatives

11. Application of 'defence imperatives' does not substitute for the demonstration that risk is managed to ALARP. Defence imperatives have a role in the substantiation of ALARP through the risk/sacrifice balance.

12. By factoring in the Defence *purpose* for carrying out an activity and Defence *implications*, ALARP can be applied in principle to all operations without constraining military or defence capability. The regulator should therefore be able to discharge its responsibility of testing that risk is managed to ALARP. In practice, however, there is a risk that a focus on the purpose for an activity might override the regulator's objective of minimising the risk in effecting it. The Authorisee should:

a) Consider ALARP and tolerability separately in evaluating a proposed activity.

b) Examine critically all ways to reduce the risk of effecting the operation (activity) and reduce it to ALARP by implementing all practicable risk reduction measures, balancing the benefit against the sacrifice[25] in time, trouble and cost in the normal way.

c) Having derived an **ALARP risk level** for effecting the operation or activity, consider whether, in the light of the requirement (the purpose) for effecting the operation, this residual risk is **Tolerable**.

[25] A submarine power reactor doesn't earn revenue. However, there is value in it undertaking its operational duties. There is a sacrifice if it does not undertake its planned duties. It might be considered that some operations are of greater 'value'; hence it might be argued that for higher value operations the sacrifice incurred in not performing the operation is greater.

13. It is the level of *residual risk exposure* that determines whether a *Defence Imperative* has to be deployed to proceed with the activity.

Operational Imperatives

14. Where the application of additional factors would result in a risk profile that **remains within the normal levels** of tolerability, and the sacrifice to achieve risk reduction has an immediate effect on Defence Output, then the Authorisee's sacrifice is an applied **Operational Imperative** in order to continue to demonstrate the higher risk level remains managed to **ALARP under the circumstances**. The claim of 'Operational Imperative' does not itself substitute for the demonstration of risk managed to ALARP applying gross disproportion.

15. Operational Imperatives might occur where the Authorisee judges that there is a requirement for a submarine to operate in the absence of completed maintenance, test or inspection. Given the circumstances, the ALARP case can potentially be made provided that (for example):

- It gives rise to a relatively small change in risk, and that the risk remains within any previously defined bounds of "tolerable"
- It is not adversely affecting any single line of defence against significant fault.
- It is not persistent operation at a submarine berth or involving initial criticality.

16. Continued operation in this abnormal and elevated risk profile should not be considered acceptable Authorisee behaviour, nor to set precedent. A 'reverse ALARP' position, is a strong indicator of poor safety management. The Authorisee should be asking – why has this situation arisen?

17. Where Operational Imperatives are applied resulting in an elevated risk profile for a period, the ALARP presentation should address:

- The issue (perhaps a material defect) must have a robust route to resolution.
- The period at risk must be for a dedicated tasking to deliver a specific defence output.
- The period at risk must be defined with a specific end date.
- The demonstration of risk managed to ALARP must describe why other assets cannot be used for the specific tasking.

Strategic Imperatives

18. In exceptional circumstance and where the application of additional factors would result in a risk profile that is **above normal** levels of tolerability, (which maybe as defined Risk

Targets), and the sacrifice to Defence Output (in time, trouble and cost) to achieve risk reduction is in gross disproportion to the safety benefit gained, then the Authorisee's sacrifice is an applied **Strategic Imperative** in order to continue to demonstrate the significantly higher risk remains managed to ALARP under the circumstances. The expected demonstration that the risk is managed to ALARP is not suspended. It should be expected that a higher authority in Defence than the Authorisee would take the decision to proceed with the activity.

19. The ALARP justification is only valid in the circumstances presented and does not set precedent for recurrence.

Regulatory Permissioning

20. Where DNSR considers the ALARP demonstration has not been adequately made, even deploying and incorporating an 'imperative' set of arguments, then DNSR will advise the Authorisee that it is unable to permission the activity.

Use of Alternative 'Defence Imperatives' or Similar Terminology

21. Only *Operational Imperative* and *Strategic Imperative* are recognised by DNSR as Defence Imperatives, as result of the differentiation detailed above.

22. Where an Authorisee cites a different justification (for example 'Programme Imperative') the Authorisee is to determine which of the above is being invoked and treat it accordingly with appropriate justification.

Annex F: The NRPA and NW MOD Design Authority Function in the Defence Nuclear Enterprise

1. IAEA has published guidance on Maintaining the Design Integrity of Nuclear Installations throughout their Operating life in document INSAG-19. Whilst principally intended for the civil nuclear programme, the principles can be applied to the DNE with some interpretation. ONR has also produced guidance on the Licensee Design Authority Capability in NS-TAST-GD-079. This guidance has been interpreted for application to the DNE. Authorisees should consider this source documentation in addition to the guidance presented here.

2. The potential consequences and harm following an incident involving the naval reactor plant or nuclear weapon mean that systems must remain safe and meet the design intent through life, which is likely to be a number of decades. The long period of service life inevitably means that changes or modifications will be made through life. Changes or modifications could have a bearing on safety and therefore should only be made with a complete understanding of the design and the consequences of any change made.

3. The Authorisee retains the responsibility for the maintenance of design intent through life and also needs to retain the detailed design knowledge necessary to maintain the system in question. This is not a trivial task through life given the extended durations involved. MOD Authorisees with Design Authority responsibilities will be identified on the Certificates of Authorisation[26].

4. The NRP and NW Authorisees responsible for design should create a Design Authority Function (or other suitable title[27]) the role of which is to ensure that the knowledge of the design needed for through life safety is available to all parts of the Authorisee organisation, and other Authorisees as necessary. The Design Authority Function should also be responsible for design configuration control and review, and should verify and approve design changes. Information provided by third party organisations such as Design Organisations or Responsible Designers should be controlled by the Design Authority Function, as well as the interfaces between the Design Authority and third party suppliers. Given the extended duration of programmes within the DNE, effective knowledge management is of key importance. Many of the personnel with detailed design knowledge during the original design phase may no longer be with the organisation later in plant or weapon life. In addition, the Design Authority Function should be able to maintain its SQEP, conducting research and studies necessary to maintain its currency.

5. The Design Authority Function is therefore an important element of ensuring design integrity is maintained through life. The Design Authority Function should be able to demonstrate that it is an intelligent customer, able to specify and understand the technical output from third party organisations and determine whether requirements set by the Design Authority Function have been met. The MOD organisation identified as owning the Design Authority Function should possess sufficient SQEP to effectively act as the Intelligent Customer for the specification of requirements and receipt of information and outputs

[26] For the NRP, the Authorisee with Design Authority responsibilities is NP Hd; for NW, the Authorisee with Design Authority responsibilities is Dir Whd

[27] It is the function and its activities which are important, not the title applied

received from the Responsible Designer or other organisations. In cases where the identified MOD Design Authority Function possesses limited SQEP, enhancement may be sought from third party sources e.g. from a Responsible Designer. However, it is the MOD Design Authority Function who controls the overall requirement set and has the decision making Authority for Approval, Modification or Withdrawal from service.

6. In delivering the Design Authority Function, the Authorisee should consider the management arrangements through which all the necessary design information is to be obtained and maintained. This may be through the development of a complete Design Authority Function within their own organisation; the assignment or delegation of the original designer the formal responsibility of a 'Responsible Designer' to act as the source of design information; the formal assignment of some elements of Design Authority Function responsibilities to a third party; some combination of defined by formal arrangement. It is for the Authorisee to describe the arrangements for the delivery of the Design Authority Function.

7. DNSR defines the NW and NRP Design Authority Function as:

a. "The defined function of an identified MOD organisation with the responsibility for, and the requisite knowledge to Approve and maintain the design intent, integrity and safety of a nuclear warhead or naval reactor plant as appropriate through life."

8. As mentioned above, the NW and NRP Design Authority Function should be able to demonstrate that it fulfils the role of an Intelligent Customer, which DNSR defines as:

a. "Where a MOD organisation relies upon the output of a Responsible Designer, it should act as an Intelligent Customer by specifying requirements, supervising the work and is able to technically assess the outputs of the Responsible Designer through life."

9. In delivering the NW and NRP Design Authority Function, the Authorisee may utilise the services of a third party, often referred to as a 'Responsible Designer'. DNSR considers the definition of a Responsible Designer to be:

a. "An organisation responsible through formal arrangements for the maintenance of detailed, specialised knowledge of the design of nuclear weapons or naval reactor plant through life, and possessing an adequate capability for the design of such as required."

10. There are two MOD Authorisees who DNSR require to deliver the Design Authority Function as described in this Annex, NP-Hd and DNO Dir Warhead. The responsibility for design will be articulated in the respective Certificates of Authorisation.

A conceptual model of the MOD Design Authority Function

11. In applying guidance on the MOD Design Authority Function to NRP and NW, DNSR has developed a diagrammatic representation which can be applied to both the NP and NW programmes with the DNE, shown below in Figure F.1.

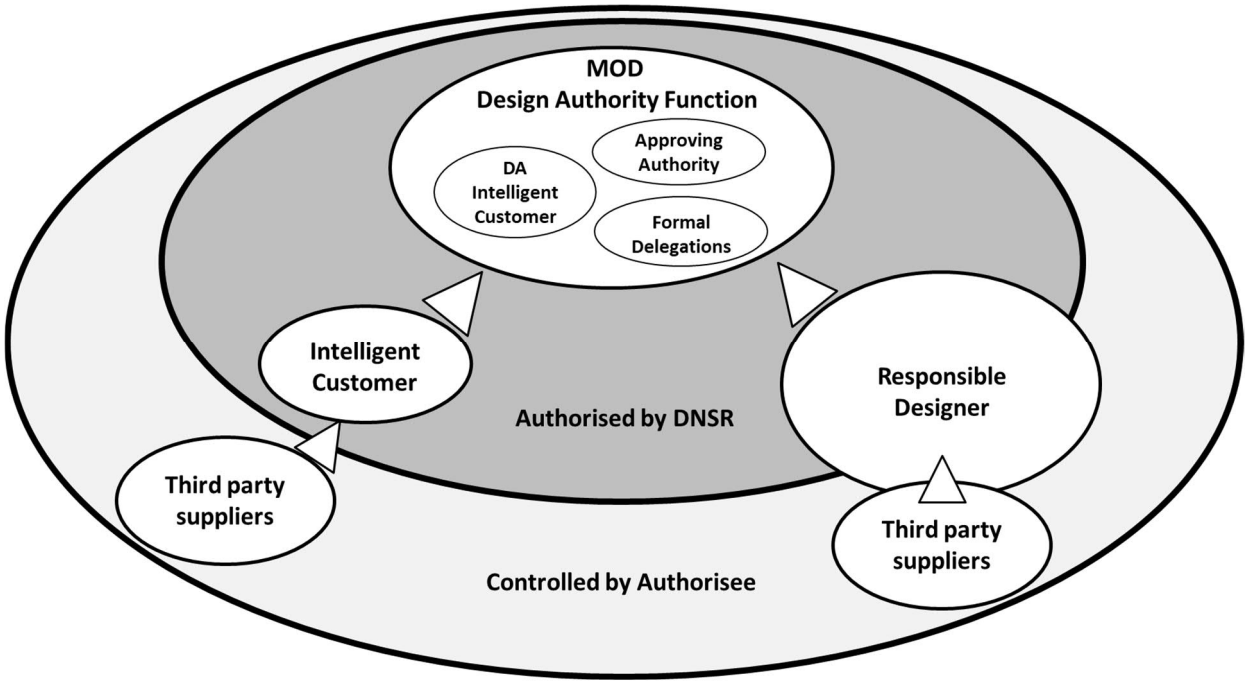

Figure F.1. The MOD Design Authority Function Construct in the DNE

12. The diagram above attempts to explain the construct described previously. The Design Authority Function will be regulated by DNSR via a Certificate of Authorisation and should act as an Intelligent Customer to any design and safety information it receives. Elements of the Design Authority Function may have been formally delegated to a third party, and these should be clearly articulated in safety management arrangements. Where the Design Authority Function is required to act as an Approving Authority, this should also be clearly articulated in safety management arrangements.

13. The Design Authority Function may require the support from an external organisation (a Responsible Designer or other suitable title) to ensure the maintenance of the design intent through life. This support should be via formal arrangements. This organisation may or may not be Authorised by DNSR. In the NW programme, the AWE Design Authority (Trident) role is Authorised by DNSR as part of the Approving and Design Authority with the AWE Design Organisation acting as the Responsible Designer; in the NNPP, the Responsible Designer is Rolls Royce, contracted by NRPA as part of the supply chain, but is not directly Authorised via a Certificate of Authorisation.

14. Other third party suppliers of design related information or material will be controlled by the Authorisee and not directly regulated by DNSR. Where DNSR seeks assurance that the Authorisee has the appropriate level of control and oversight of their supply chain, DNSR reserves the right to engage with the supply chain as appropriate.

Annex G: Guidance on Leadership and Management for Safety

1. In common with other regulators in high-hazard industries, DNSR places great emphasis on the importance of effective Leadership and Management for Safety (L&MfS) in Authorisees and duty holders, including the development and maintenance of a positive safety culture. Indeed, one of DNSR's duties as a Defence Regulator is to 'promote an engaged safety culture', as is stated in the DSA Charter, and amplified in DSA01.1.

2. DSA01.2 Chapter 5 Safety Culture requires Top Level Budget owners and Chief Executives of Defence Executive Agencies to maintain policies and processes that develop and promote a positive safety culture throughout their organisation and area of responsibility. Further, personnel at all levels within Defence are required, by example, to promote a positive safety culture throughout their area of responsibility and sphere of influence.

3. Leadership and Management for Safety should be demonstrated by Authorisees and should ensure:-

- Visible and proactive leadership in promoting safety;
- Staff contribution to the management of Health, Safety and Environmental Objectives;
- The management of HS&EP is embedded throughout the organisation with two-way communication, open reporting and decision making which is transparent and responsive;
- That Just, Reporting, Learning, Questioning and Flexible behaviours are actively promoted, supported and maintained
- Human Factors are appropriately considered within their Safety and Environmental Management Systems;
- That managers and employees are encouraged to constructively challenge where safety or the environment are at risk.

4. An effective safety culture should be able to demonstrate the following:-

a. Leadership Commitment – Demonstrable leadership commitment is vital if a successful Safety Culture is to develop within an organisation; it is unrealistic to expect the desired culture to flourish without it ;

b. Open Communication – Clear and unguarded communication of safety related information, throughout all levels of the organisation, is required if the intelligence contained within such information is to be exploited to the full;

c. Effective Decision Making – Safety needs to be fully embedded within all aspects of an organisation's evidence based decision making processes to ensure that the safety impact of any decisions is considered and understood.

5. An effective Safety Culture comprises several elements, including:

a. A just culture that recognises that human error is often a factor in incidents and accidents and that honest errors can be made. Such errors are dealt with fairly and appropriately.

b. Open and honest reporting of safety concerns by stakeholders at all levels, with all personnel actively participating in the reporting system ans supporting learning and improvement in safety.

c. Proper communication and investigation of occurrences and active management of resultant recommendations. Learning from experience is a central part of an effective Safety Culture.

d. A questioning culture where people are encouraged to ask questions as opposed to making and accepting assumptions.

e. A flexible approach to the resolution of safety concerns without recourse to rigid adherence to inadequate practices.

6. DNSR gathers and uses evidence relating to an Authorisees' L&MfS and safety culture as part of its routine regulatory activities; specific regulatory reviews of an Authorisee's L&MfS and safety culture may also be undertaken. DNSR will engage with Authorisees on their L&MfS performance.

Further Sources of Guidance

ONR Technical Inspection Guides	NS-INSP-GD-070	Safety Culture Guide For Inspectors
ONR Technical Assessment Guides	NS-TAST-GD-093	Guidance for undertaking Leadership and Management for Safety Reviews *** Currently withdrawn pending review
IAEA Standards	GSR Part 2	Leadership and Management for Safety
ONR Safety Assessment Principles	ONR SAPs, 2014 Edition, Revison 1 (January 2020)	ONR Safety Assessment Principles for Nuclear Safety, 2014 SAPs MS.1-4.
UK Nuclear Industry Guide	Published on behalf of Nuclear Industry Safety Directors' Forum	The Periodic Review of Leadership and Management for Safety

Annex H: Guidance on Security-informed Nuclear Safety (SINS) in the Defence Nuclear Enterprise

1. The aims of nuclear security and nuclear safety are complementary, with both intended to reduce risk. Measures that address the requirements of nuclear security may also address the requirements of nuclear safety, and vice versa.

2. In the 2006 revision of the HSE Safety Assessment Principles used by both ONR and DNSR, the class of external hazards was expanded to include “malicious acts” for the first time, recognising that the consequences of such acts could harm the workforce or the public through the release of radioactive material. In the civil programmes, the safety and security regulators worked together to amplify their expectations of Licensees’ approach. Within the DNE the intent to commence a similar process was identified in a joint DNSR/ONR letter in January 2012 to all Authorisees/Licensees in the DNE.

3. The 2017 ONR Security Assessment Principles for the Civil Nuclear Industry provides fundamental guidance to duty holders on nuclear security and recognises that while malicious acts such as theft or sabotage would not normally be considered when determining the reasonably practicable preventative or protective measures needed in the interests of safety, what might be done to mitigate the consequences from such acts should nevertheless be considered within safety and security assessments.

4. DNSR expects that malicious acts will have been considered in safety submissions as part of the normal Periodic Review of Safety (AC15 arrangements) for existing facilities. Similar considerations will be expected in the design of new facilities, equipment, transportation and any future warhead or warhead modification programmes.

5. DNSR will continue to develop a mutually constructive relationship in this field with the DNE and the Defence Nuclear Security Regulator (DefNucSyR) to provide a joined-up, consistent approach to the Authorisees to ensure safety and security requirements are not considered in isolation and that any 'trade-offs' between security and safety benefits are clearly understood and managed in reducing risks to ALARP. To this effect, DNSR and DefNucSyR established a Letter of Understanding (LoU) between both organisations in March 2018. DNSR and DefNucSyR will continue to work with the DNE, at all levels, in developing and establishing a SINS Framework, aimed at the improvement of culture, interactions, mutual assurance and integration of nuclear security and nuclear safety to ensure the best through-life approaches are identified.

Annex I: Interpretation of Safety Assessment Principles for Naval Nuclear Propulsion Application

Foreword

Foreword

1. On behalf of the Office for Nuclear Regulation (ONR), the HSE issued updated Safety Assessment Principles (SAP) for Nuclear Facilities towards the end of 2006 for use by ONR assessors and site inspectors. An updated version of the SAP was subsequently published in 2014, and revised in 2020, incorporating lessons learned from the 2011 Fukushima accident, and reflecting developments in international nuclear safety standards and relevant good practice since 2006. The Defence Nuclear Safety Regulator (DNSR) uses the same principles in its assessment of the Naval Nuclear Propulsion Programme (NNPP), and to facilitate this, DNSR was engaged in the formulation of the SAP during both the 2006 and 2014 reviews. The benefits of adopting common assessment principles include:

    - helping to demonstrate that the NNPP applies, so far as reasonably practicable, standards as high as those applied in the civil industry, in line with the Secretary of State (SofS) for Defence's policy;
    - the avoidance of any potential to place different requirements at licensed and authorised sites;
    - facilitating joint regulatory working to the benefit of both regulators and the regulated.

2. DNSR believes that the SAP are generally applicable to the assessment of projects and programmes within the NNPP. The SAP do not represent a prescriptive compliance requirement[28]. DNSR continues to take an interest in Authorisees' internal prescription and guidance to check consistency (not compliance) with SAP.

3. Notwithstanding the above statement, and DNSR's engagement in the formulation of the SAP, there are inevitably areas where a DNSR assessor or inspector might need to interpret a SAP in a particular way to take account of the special constraints applicable to the NNPP. This is recognised in the So Far As Is Reasonably Practicable (SFAIRP), As Low As Reasonably Practicable (ALARP) and As Low As Reasonably Achievable (ALARA) section of the SAP where at paragraph 16 on page 9 it is stated that the principles themselves should be met so far as is reasonably practicable. Similarly, paragraph 25 on page 11 of the SAP concludes: …….In short, the principles are a reference set from which the inspector should choose those relevant to the particular situation. DNSR has reviewed the SAP to identify particular principles where further interpretation is beneficial for application in the defence environment, and has considered how they should be interpreted in the NNPP context to achieve an ALARP position in nuclear safety which also optimises holistic programme safety while remaining consistent with SofS for Defence's policy.[29]

4. There are other SAP which are of special relevance to the NNPP because of (for example):

    - the nature of the plant and the way it is operated;
    - the development of the NNPP safety justification structure has led to perceived weakness or lack of clarity in these areas.

5. DNSR has also attempted to identify these SAP to indicate specific regulatory expectations to assessors and Authorisees.

[28] Note paragraph 3 of the Introduction on Page 7 of the SAP.
[29] Expressed in DSA01.1.

6. Specific interpretations, observations and guidelines are given below, under headings 1 to 7. They are inevitably somewhat disjointed since they pick up on specific SAP and supporting paragraphs, most of which DNSR considers to be applicable without interpretation. To aid identification of the relevance of these interpretations, they are presented as follows:

    - by topic area or sub-area in descriptive form, eg. safety analysis;
    - reference to relevant SAP and/or supporting paragraphs to which the interpretation will be applied;
    - how DNSR assessors and inspectors will evaluate Authorisees' submissions in these topic areas taking account of the relevant SAP and any special constraints applicable to the NNPP.

7. The SAP, their related paragraphs and the interpretation provided here for the NNPP give only high level guidance to inspectors and assessors; more detailed guidance for assessors in particular has been, and will continue to be, provided in ONR's Technical Assessment Guides (TAG). Engagement with ONR on development of their TAG is managed through the Regulatory Policy Committee.

Interpretation of ONR SAP in the context of the NNPP is presented against a number of topic areas. These are identified below and discussed in detail in the following tables.

1. NNPP interfaces, interdependencies and transfers of through life responsibilities

2. Safety Cases
    a Safety Analysis – Systematic Approach, Hazard Identification (HAZID)

    b Safety analysis – Demonstration of Sound Engineering Practice, Derivation of Operating Limits, EIMT, Commissioning Trials, etc. and ALARP Considerations

    c Safety Analysis - Optimisation of Protection and Balanced Plant Design

3. Engineering Justification
    a Inherent and Passive Safety

    b Codes and Standards

    c Redundancy and Diversity; Single Failure Criterion -

    d High Integrity Design

    e Ageing and Degradation

    f Materials Control, Welding and Inspection

    g Purpose and Limitations of Commissioning

4. Design Basis Analysis

5. Design for Safety

    a Consistency with Function

    b Safety Systems

    c Monitoring and Control

6. Role of Operator
7. Numerical Targets

Structure

8. Figure I.1 shows how SAP and interpretation for the Defence Nuclear Programme are structured. The applicability of any SAP (or its interpretation) in forming a judgement is determined by DNSR staff, in discussion if appropriate with the Authorisee or Approving Authority making a submission.

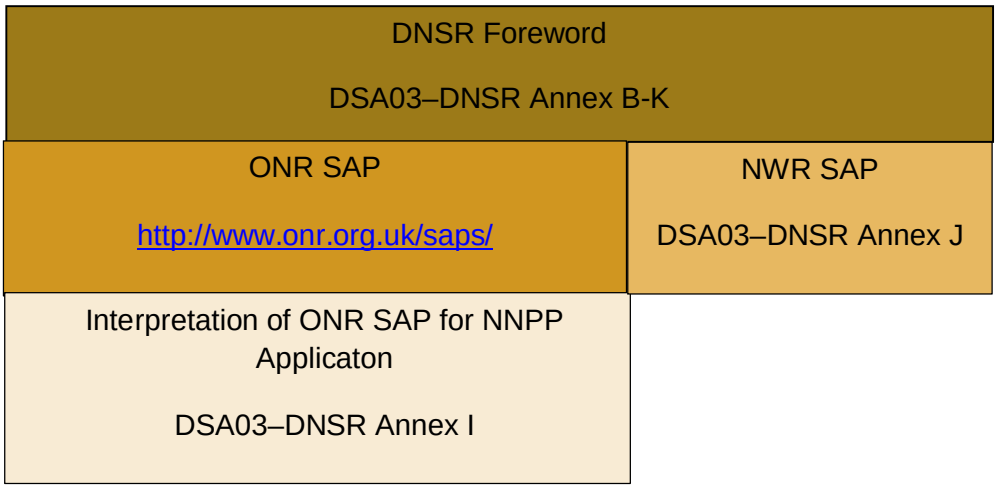

Figure I.1

1. NNPP INTERFACES, INTERDEPENDENCIES AND TRANSFERS OF THROUGH LIFE RESPONSIBILITIES

Fundamental Principle	Responsibility for Safety	FP.1
Associated SAP Paragraphs	111 and 113	
Associated Reading	Duty of Cooperation DNSR TAG D011 – DNSR Guidance on Safety Analyses and Safety Case Interfaces in Defence Nuclear Programmes	FAC1

DNSR Specific Guidance to Assessors

The SAP are written for the case where there is generally a facility operator for a static plant who is the licensee and clearly has responsibility for day to day and through life safety of the plant.

The situation is complicated in the NNPP by the mobile nature of the plant and the fact that its facility operator while at sea has other very serious safety responsibilities besides nuclear.

Accordingly, a safety management system has been developed whereby the Naval Reactor Plant Authorisee (NRPA) lays down strict prescription in the manner of operation of the plant by naval engineers, based upon advice from the design authority (DA). Some aspects of this system have been tested over time, but others have had to be developed or modified to take account of revised contracting arrangements and to ensure good management of site risks.

DNSR inspectors and assessors, in applying the SAP, need to look for:

- An identifiable facility operator with responsibility for day-to-day safety of plant operations or maintenance who understands and accepts that responsibility.
- Support from the NRP DA via the NRPA to ensure that the planned operations are within the design intent, and do not give rise to unexpected hazards.
- Satisfactory, clear and jointly agreed interface arrangements between Authorisees responsible for the plant at other stages of its life cycle to enable the facility operator to discharge their responsibility for day-to-day safety (see FAC1)
- Appropriate engagement of the NRPA to ensure that the through-life safety of the plant is not compromised.

This is a vital function in the NNPP which currently lacks a direct parallel in the civil nuclear industry (though other safety critical industries have to manage more complex interfaces). Accordingly, DNSR has issued an NNPP specific TAG to help both assessors and Authorisees understand reasonable expectations for the management of interfaces between Authorises to ensure day-to-day and through-life safety.

2. SAFETY CASES

2.a Safety Analysis – Systematic Approach, Hazard Identification (HAZID)

Engineering principles: key principles	Safety function	EKP.4
Engineering principles: safety classification and standards	Safety categorisation	ECS.1
Engineering principles: safety systems	Demonstration of adequacy	ESS.11
Fault analysis: general	Identification of initiating faults	FA.2
Fault analysis: PSA	Need for PSA	FA.10
Fault analysis: assurance of validity of data and models	Sensitivity studies	AV.6
Associated SAP Paragraphs	89, 101a, 101b, 407, 618, 620, 644, 646, 656, 660, 669, 692	
Associated Reading	DNSR TAG D011 – DNSR Guidance on Safety Analyses and Safety Case Interfaces in Defence Nuclear Programmes ONR NS-TAST-GD-051 The Purpose, Scope and Content of Safety Cases	

DNSR Specific Guidance to Assessors

The SAP indicate many desirable features of a safety analysis and the process used to generate it. DNSR assessors should seek:

- Identification of the failure modes of the plant or equipment by a systematic, auditable and comprehensive hazard identification (HAZID) process appropriate to the nature and function of the plant.
- Identification of the safety function(s) to be delivered within the facility by a structured analysis starting with principal Critical Safety Functions and HAZID.
- A staged process from HAZID through analysis in a fault schedule (which can also incorporate a safety schedule) to safety function identification and confirmation, and initiating sequences for input to a PSA.

The PSA can be considered a high level output from a hazard analysis process which starts with HAZID. HAZID should engage creative thought to identify potential routes to radiological hazards. This process is an integral part of design development and analysis. There should be some interaction between the PSA and design (an example concerning balanced safety cases is mentioned at 2.c below) for which an early draft PSA should be planned.

PSA should be based upon best estimate data so that designers and operators can focus on true high risk areas. However, PSA must not be unduly optimistic, and uncertainties which potentially undermine confidence in the PSA results might justify a conservative or bounding case approach to input data. This should be avoided if at all possible where the

PSA output is sensitive to the specific data, and frequent simple sensitivity analyses should be used to prevent a distorted PSA output.

Safety analyses in the NNPP have not always demonstrated consistency with the basic requirements outlined above, and DNSR assessors should drive to see them achieved in future analyses. The SAP include other desirable features which may inform DNSR assessors in making their judgements.

2.b Safety Analysis – Demonstration of Sound Engineering Practice, Derivation of Operating Limits, EIMT, Commissioning Trials, etc. and ALARP considerations

The regulatory assessment of safety cases	Safety case characteristics	SC.4
Engineering principles: commissioning	Commission Testing	ECM.1
Engineering principles: Maintenance, inspection and testing	Identification of requirements	EMT.1
Associated SAP Paragraphs	101d, 101e, 101f, 102, 199, 203, 701, 752, 754	

DNSR Specific Guidance to Assessors

The SAP call up the need to demonstrate the maintenance of a sound design intent by:

- Application of sound engineering practice at all stages of the design and manufacture of the plant.
- Derivation of operating limits and essential maintenance from the design and safety analysis.
- Definition and satisfactory completion of commissioning trials to demonstrate as far as possible the design intent.

The paragraphs and principles listed above provide insight into different aspects of safety analysis. It is not immediately clear that this linkage must be visible and traceable from the safety case, as the link is not made obvious in the supporting text to the Regulatory Assessment of Safety Cases section.

In the NNPP there remains some disconnect between the safety case and the demonstration of these essential links between design and operation; it remains an area for improvement.

The DNSR assessor should emphasise this requirement of the safety case to duty holders and test that it has been achieved, quoting specific paragraphs and principles (e.g. those listed above) as appropriate.

The conditions and limits of safe operation (CLOSOs) are required by AC23; these should be identified within a safety case.

The demonstration that the ALARP principle has been applied appropriately is another essential output from the safety case. There is a danger both within and without the NNPP that ALARP is treated purely as a cost benefit analysis (CBA) exercise. Though CBA may form an important part of an ALARP justification, the application of current sound engineering practice in new plant is overriding. It should be done whether or not it results in a quantifiable lowering of risk and even if the risk is below the BSO[30].

[30] NS-TAST-GD-005Technical Assessment Guide - Guidance on the Demonstration of ALARP

2.c Safety Analysis – Optimisation of Protection and Balanced Plant Design

Fundamental principles	Optimisation of protection	FP.3
The regulatory assessment of safety cases	Safety case characteristics	SC.5
Engineering principles: key principles	Safety measures	EKP.5
Fault analysis: PSA	Need for PSA	FA.10
Associated SAP Paragraphs	103, 155e and 646	

DNSR Specific Guidance to Assessors

References to optimisation, balanced case and balanced design appear in the SAP and it is important that the DNSR assessor interprets these in a manner appropriate to the context of the naval plant. Optimisation of protection is a fundamental principle which also supports ALARP. However, optimised protection during one phase of a NRP life cycle may not achieve the same end in the next phase, and the assessor examining this phase must be flexible in there judgement.

Furthermore, the nuclear powered warship's crew are subject to many risks beside nuclear, such that optimisation of their safety may not be the equivalent of optimisation of the nuclear risk during the operational phase of the nuclear powered warship's life (this is a factor which will affect many DNSR judgements).

This constraint will not apply to workers and local population while the nuclear powered warship is in a port or dockyard; nuclear safety as it affects them must be shown to be ALARP. However, the balance of plant and dockyard protection systems to achieve tolerable and ALARP risks might not necessarily be optimised for the docked phase due to the constraints of the operational phase, and DNSR assessors need a broad understanding to be able to test whether the right balance has been achieved.

Another desirable characteristic of a safety case is that of balance in the case and the design such that predominant risks are not driven by single or a small number of failure modes to an unacceptable degree; similarly, an over-reliance on single protection systems or barriers should be avoided. As paragraph 646 of the SAP states: *PSA should assist the designers in achieving a balanced and optimised design…* and early first cut PSA work should be carried out to identify any imbalances while they can still be addressed in the basic design, protection systems or operating procedures. In assessing NNPP safety cases, DNSR should:

- Apply the SAP relating to balanced safety justification.
- Challenge shortfalls to test whether they are driven by the fundamentals of the NRP.
- Test whether an apparent imbalance is mitigated by reliable evidence of low failure probability in making its judgement.

3. ENGINEERING JUSTIFICATION

3.a Engineering Justification - Inherent and Passive Safety

Engineering principles: key principles	Inherent safety	EKP.1
Engineering principles: external and internal hazards	Use, storage and generation of hazardous materials	EHA.13
Engineering principles: control of nuclear matter	Storage in a condition of passive safety	ENM.6
Radioactive waste management	Storage of radioactive waste and passive safety	RW.5
Associated SAP Paragraphs	145-147, 151c and 155	

DNSR Specific Guidance to Assessors

The SAP mention both inherent and passive safety as desirable features of a design. In the nuclear powered warship context, DNSR assessors need to take account of consistency with function in assessing how well duty holders meet these principles.

The nuclear powered warship brings together explosives and other hazardous materials within the same containment as a reactor which combines fissile material and a moderator. This breaks the simplest interpretation of inherent safety[31]. The key point is whether inherent safety is maximised consistent with the plant's function (see EKP.1).

Methods and approaches for the minimisation of unnecessary hazards are outlined at paragraph146, and DNSR assessors are encouraged to test the application of these principles in the context of ALARP. That is not to say that DNSR should ignore the concept of inherent safety; for example, where a new plant, plant line-up or evolution is proposed which increases the inherent hazard, this should be challenged and a justification that it is both essential to the plant function and that this aspect of its function is worth the increased hazard, should be sought. However, the fundamental concept of the nuclear powered warship will be treated as a "given" even though it is in some ways inimical to inherent safety.

The SAP refer to passive safety in the context of the storage of radioactive materials (see ENM.6 and RW.5). It is not the same as inherent safety which would require removal of the hazard, but seeks hazard control by fundamental, simple, robust, physical measures in preference to safety systems which need to respond actively to a fault. This feature is also desirable in reactor design and is readily applicable to civil plants. It is harder to engineer in the nuclear powered warship context where space is limited, but should not be dismissed as a principle to be applied. As an example, the HPDHR system on the NRP can be considered a passive system *once triggered and once flows are established*; the adoption of hang-open non-return valves to permit DHR via SGs is a passive system which is not reliant on an active triggering system.

[31] The same could be said of any nuclear reactor design; a Magnox reactor combines metallic magnesium and uranium in a block of coal with vertical gas passages

3.b Engineering Justification - Codes and Standards

Engineering principles: safety classification and standards	Safety classification of structures, systems and components	ECS.2
Engineering principles: safety classification and standards	Codes and Standards	ECS.3
Engineering principles: safety classification and standards	Absence of established codes and standards	ECS.4
Engineering principles: safety classification and standards	Use of experience, tests or analysis	ECS.5
Engineering principles: maintenance, inspection and testing	Type-testing	EMT.3
Associated SAP Paragraphs	167, 168, 170, 172, 173, 205, 259 and 318	

DNSR Specific Guidance to Assessors

The safety classification assigned to each system, structure or component (SSC) provides the basis for identifying appropriate codes and standards for the design, manufacture and operation of SSCs. An SSC important to safety is one which delivers a safety function and provides a direct role in nuclear safety, or one which indirectly affects nuclear safety and whose failure could adversely affect an SSC which delivers a safety function. Design codes such as ASME III for nuclear components embody knowledge, experience and best practice, and achievement of their requirements provides a level of assurance that the delivery of a safety function can be met. Assessors should check that codes applied in the NNPP are selected and used appropriately, as the most common failure in this area is the use of codes outside their intended scope.

It is preferable to base an SSC important to safety on normally accepted codes and standards but ECS.4 & 5 recognise that this may not always be possible and suggest other means on which an acceptable case may be based. This should not be seen as a simple alternative; the burden of evidence is likely to be significant, depending on the classification and importance. One approach is to draw on existing codes and standards which ensure a conservative design that is commensurate with the safety classification and the importance of the delivery of the safety function. However, this will not always be possible, particularly in the NNPP where constraints and particular design objectives apply (this is explored in 3.c below). This can demand the development of NRP specific codes, potentially supported by limited operational experience and testing. This is not new in the UK nuclear powered warship programme. A development in the NNPP is the potential to achieve a significant advance in design leading to improved nuclear powered warships and nuclear safety by the use of information and even designs from the much larger US submarine programme. Again, these designs have been supported by internal design codes, which are not necessarily in the public domain. The DNSR assessor needs to follow a similar approach to that for earlier UK internal codes, i.e.

- Understand why normally accepted codes and standards are not appropriate, and agree that the constraints and/or benefits demand the use of non-standard codes.
- Agree that the non-standard code is soundly supported by the best available operational and test data, and makes the best possible use of read-across from the accepted codes and standards.
- Check that appropriate conservatism has been applied where operational and test data is very limited.
- Test that the code is not tailored to support the existing design.

Paragraph 170 indicates that there may be situations where codes and standards *should be supplemented or modified as necessary to a level commensurate with the importance of the relevant safety function(s)*. Assessors should note that, although design to established codes and standards provides the basis for delivering safety functions, the standard of analysis demanded may be substantially higher, depending on the classification of the SSC. For example, in structural integrity cases, pressure vessel failure statistics suggest a failure frequency of the order of 10^{-5} per year as a typical limit to the level of reliability that might be inferred from compliance with the design, manufacture, testing and inspection requirements of established codes. So, high integrity or incredibility of failure classifications usually involve additional measures beyond basic compliance with design codes to substantiate the higher reliability claim. NRPA publication 4-1-11, Classification, provides guidance in Table 1 relative to the required reliability.

The guidance at paragraph 173 cautions against combining different codes and standards for justifying a single aspect of an SSC; assessors should be cautious of the selection of different codes where this appears to be tailored to support the existing design rather than as a design improvement tool. It can sometimes be justified, however. An example is the demonstration of defect tolerance in structural integrity cases where ASME III design rules are supplemented by assessment to the R6 procedure; two standards are used because of the inherent limitations of the ASME design rules. The sub-division of responsible DAs and systems used in the NNPP means that different codes and standards may be employed for different aspects of the same SSC. In such cases, assessors need to be aware of potential incompatibility between standards.

It must also be recognised that some codes do not deliver firm design rules, but guidance as to how a design substantiation may be achieved, and the principles to be adopted in estimating the strength of particular legs of the case[32]. The code does not deliver a right or wrong answer. This is difficult for DNSR to assess, as it could require the assessor to gain the same detailed understanding of science and mechanics of potential failure as the designers. However, one objective of regulation is to build trust with Authorisees and their internal safety authorities such that the regulator can gain assurance by a number of probing questions to the Authorisee. The assessor may also suggest to the Authorisee early regulator involvement in the design process to de-risk a time-consuming regulatory assessment at a critical time in the project.

[32] An example of this is the output from the Technical Advisory Group on Structural Integrity (TAGSI).

3.c Engineering Justification - Redundancy, Diversity and Segregation and Single Failure Criterion

Engineering principles: design for reliability	Failure to safety	EDR.1
Engineering principles: design for reliability	Redundancy, diversity and segregation	EDR.2
Engineering principles: design for reliability	Common cause failure	EDR.3
Engineering principles: design for reliability	Single failure criterion	EDR.4
Engineering principles: safety systems	Determination of safety system requirements	ESS.2
Engineering principles: safety systems	Dedication to a single task	ESS.19
Engineering principles: safety systems	Avoidance of connections to another system	ESS.20
Engineering principles: safety systems	Reliability	ESS.21
Engineering principles: safety systems	Computer-based safety systems	ESS.27
Engineering principles: reactor core	Shutdown systems	ERC.2
Associated SAP Paragraphs	180, 185, 188, 304, 413, 420, 544, 545	
Associated Reading	IAEA Safety Standards – GSR Part 4 and SSG-2	

DNSR Specific Guidance to Assessors

EDR.1-4 and their associated paragraphs are sound design principles aimed at increasing the reliability of a safety critical function or safety mechanism. In considering the application of these SAP to the NNPP, there is a need to explore a potential difference between typical civil nuclear operations and the naval propulsion programme. For naval plant a loss of output can put lives at risk as effectively as a nuclear accident[33]. The potential effect of a loss of output in an operating nuclear powered warship is explored briefly in Section 7, paragraph 4 herein on societal risk. However, its implications affect many SAP covering redundancy and diversity, safety systems, role of the operator, etc. The high risk of nuclear powered warship operations which can be mitigated by propulsion availability, especially though not exclusively during wartime, was recognised in the early design principles for the naval reactor plant. Thus the concept of a responsible control system, the battleshort switch, and permitted abnormal operating modes were all part of the design basis. Reliance on a battleshort protection system bypass is not an acceptable means to deliver peacetime propulsion availability, but the other design bases are still valid.

Increasing the reliability of a safety critical function will generally also support nuclear powered warship safety, but increasing the reliability of a safety mechanism which triggers plant shutdown without considering the risk of spurious shutdown may be inimical to nuclear powered warship safety. The delivery of high propulsion reliability may be in conflict with

[33] ie. a shutdown plant is not necessarily a safe plant on a nuclear submarine

the desire to have diverse protection systems where that could increase the probability of spurious trips. DNSR assessors should be open, though challenging, to the argument from naval reactor designers that they can achieve a high reliability of protection from a small number of simple high integrity systems with the benefit of ease of EIMT as well as greater responsibility.

There are also severe space constraints in nuclear powered warships which will make it difficult to achieve the desired segregation and diversity (EDR.2). Paragraph 413 in the SAP is a counsel of perfection with regard to the segregation and protection of safety systems, which it will not always be practicable to achieve[34]. DNSR assessors should apply practical interpretation in line with the SFAIRP qualification described at paragraphs 9-18 of the SAP when considering the achievement of diversity and separation of function, taking account of nuclear powered warship constraints.

Another potential ramification is that safe nuclear powered warship operation is helped by reactor protection which permits fast recovery and can continue to deliver propulsion for a time from a sub-critical reactor. Achievement of these is facilitated by the use of software based control systems, which may not be consistent with SAP ESS.19, 20 and 21 (though ESS.27 recognises the possibility of using software-based control).

Thus some deviation from SAP may be justified to enhance the holistic safety of nuclear powered warship operation, and the DNSR assessor should evaluate critically any arguments advanced along such lines. However, the balance of risk, particularly to the public, changes when the nuclear powered warship is in port or port approaches such that the SAP should be applied. A switch to more conventional control algorithms and different operating procedures may well be possible to deliver optimum safety in all life cycle phases. The DNSR assessor should challenge, and seek to understand any arguments that this is impracticable, and demand an ALARP justification if it results in a significant public risk.

ERC.2 of the SAP relating to diverse shutdown systems is an example of the above, and a brief exploration of DNSR expectations might be helpful. It carries the rider that it applies to civil reactors; naval reactors have a single means of both reactor control and fast shutdown, which is argued for various reasons to be more reliable than the control system in a civil reactor. Civil reactors also use the reactor control rods for fast shutdown, but include alternative reactivity reducers which are (more or less) fast acting and (more or less) diverse depending on the reactor type. It is arguable whether these achieve diverse fast shut-down or diverse hold-down. The arguments (involving nuclear powered warship safety) against diverse fast shutdown in a nuclear powered warship at sea are understood by DNSR, and its absence gives rise to no significant public risk. The same is not self-evident for a nuclear powered warship in port, and, where no diverse hold-down system is made available, DNSR needs to understand the justification for this departure from civil practice, supported by an ALARP case if appropriate.

The Single Failure Criterion (SFC) is quoted at EDR.4 and paragraph 188 in the SAP and has no direct equivalent in the naval nuclear safety principles. As written, and interpreted in a literal manner, it would be hard to meet for any nuclear plant, so it has to be asked "what is the objective sought in improving reliability by design?"

The SFC is a widely used test of safety functions, particularly their redundancy. It has application in high-integrity industries including aerospace and petrochemicals as well as nuclear utilities. The IAEA promotes the SFC as an essential requirement of the design of nuclear power plant and its Safety StandardSSG-2, referenced at SAP paragraph 175, gives much more detail on the application of the SFC. DNSR assessors and interested Authorisees are encouraged to use this as a practical guide, recognising that ALARP considerations apply to this principle.

[34] This is not to say that segregation cannot be achieved because it's a submarine. The DNSR assessor should rigorously test the justification for shortfalls against this SAP, while understanding the limitations and constraints of submarine operation

The two UK civil nuclear generating companies have developed the basic SFC concept and included it within their internal safety guidelines; DNSR assessors might reasonably expect NNPP Authorisees to do the same. They should seek and evaluate similar relevant guidelines from NNPP internal safety authorities such as the NRPA (and then test adherence to them).

Note that the SFC refers to safety functions including negative reactivity insertion, heat removal and ECCS. Specific hardware systems and components contribute to the achievement of these functions and they should each include appropriate levels of redundancy, diversity and segregation which are commensurate with the required continuous duty or demand-related reliability.

The SFC described in the IAEA reference above, covers normally permissible states of plant availability to include the worst possible configuration of the safety group. DNSR interpretation is that this refers to operation within the design basis including any reduced operational or maintenance states permitted by the design basis. It does not include beyond design basis conditions, nor does it cover abnormal and time-limited conditions such as urgent or unplanned maintenance. A corollary is that any assumed failure must be reasonably foreseeable within the design basis. Where specific measures have been taken to ensure the high integrity of systems or components, postulating a random failure of those systems or components in the context of a test of the SFC would not be appropriate. Obvious examples are where an incredibility of failure or a special case procedure safety case has been assembled in recognition of the safety significance or lack of defence in depth of a component or system.

Consequential failures, sometimes referred to as cascaded failures, resulting from the assumed random single failure should be considered as an integral part of the single failure. This is because the key issue is the tolerance to the initiating failure not the analysis of all failures in the system.

The IAEA differentiates between random active and random passive failures. Examples of active failure events include the failure of a pump to start, a valve to operate or an incorrect action on the part of an operator. Passive failures are exemplified by the random and spontaneous leakage or rupture of a pressure system or tank or the undisclosed blockage of a flow line with debris. The view is that random active failures are of far greater significance because, in general, the failure rate will be several orders of magnitude higher than for passive failures. This can be offset by well designed maintenance and test regimes which DNSR should test as part if its assessment.

3.d Engineering Justification - High Integrity Design

Engineering principles: pressure systems	Removable closures	EPS.1
Engineering principles: Integrity of metal components and structures: highest reliability components and structures	Safety case and assessment	EMC.1
Engineering principles: Integrity of metal components and structures: highest reliability components and structures	Use of scientific and technical issues	EMC.2
Engineering principles: Integrity of metal components and structures: highest reliability components and structures	Evidence	EMC.3
Engineering principles: Integrity of metal components and structures: highest reliability components and structures	Defects	EMC.5
Associated SAP Paragraphs	275, 283, 284, 291, 292, 293, 303, 317, 318 and 417	

DNSR Specific Guidance to Assessors

Principle EPS.1 paragraph 275 is aimed at the provision of measures to prevent the failure of a removable closure to a pressurised component or system whose failure could lead to a major release of radioactivity. It includes design provisions and procedural controls to ensure the integrity of bolted joints. Examples of removal closures for the NRP include the access covers for inspection of the pressuriser and removable closures to vessels e.g. the RPV closure head. In principle it could also be applied to the design of the containment. Paragraph 275 specifically calls for ***adequate*** levels of diversity and redundancy in closure methods. The adequacy judgement will need to consider the consequences of failure taking into account the potential for radioactivity release and personnel exposure, and the barriers to environmental release. Thus a removable closure (including valves) to a normal operating plant at full pressure might demand a full diverse protection if it is outside the containment, while a temporarily removable closure within containment to a depressurised plant during maintenance might not need any additional protection (beyond the containment).

Taking the RPV head as an example of a major closure within the containment, failure is prevented by design, manufacture, and inspection and testing to recognised codes and standards in combination with procedural controls. Redundancy may be claimed from the provision of additional studs to limit the effects of a stud failure on the integrity of the joint. Full protection against failure through diversity of closure as implied in the text at paragraph 275 may not be a reasonably practicable option, but a degree of diversity may exist to limit the consequences of a failure e.g. the provision of both mechanical and toroid seals as leak-limiting features of the RPV closure head. Assessors should also gain assurance that effective procedural controls are in place to maintain the integrity of removable closures, prevent tampering and demonstrate the integrity of such closures through the plant life.

In some structural integrity cases there may be either limited or no defence against the consequences of a gross or disruptive failure of the component such that the failure frequency of the component becomes an initiating event frequency. In such situations, a

high reliability claim is required for non-redundant components. Assessors should note that where high reliability is claimed, a disruptive or gross failure frequency of less than 10^{-5}/y needs to be justified. However, as mentioned in 3.b above, a working rule is that a failure frequency of the order of 10^{-5} is the limit to what might be claimed from compliance with conventional pressure vessel design codes such as ASME III, and there is generally insufficient nuclear operating experience to substantiate failure frequencies of less than 10^{-5}/y from statistical data[35]. For this reason, among others, the assessment of structural integrity cases tends to be based on deterministic methods using established engineering practice rather than a probabilistic approach as used in a fault analysis or PSA studies. The justification of high reliability is made by invoking additional analysis and by specific examination of service loads and failure modes to infer that the failure frequency is acceptable (see also paragraph 291). The second part of paragraph 318 draws attention to the importance of considering all sources of loading which contribute to the crack driving force which, for the NNPP, may include thermal stress and residual stresses. This collection of deterministic arguments infers conceptual defence in depth and is referred to as an *alternative argument*, as the usual route of the provision of explicit engineered protection and defence in depth (redundancy, diversity and segregation) supported by failure frequency data is not available. The approach is the same as that invoked in the past where it is referred to as an 'alternative demonstration' under Principle 21 of the SPSC, or the 'special case procedure' in the early editions of the SAP.

High reliability claims attract a rigorous design substantiation and assessment. The guidance in paragraphs 292 and 293 points out that the need for such claims should be avoided where practicable by the provision of physical defence in depth[36]. Assessors should therefore give careful scrutiny to why such a claim is necessary and seek assurance that the provision of physical defence depth has been given careful consideration. For structural integrity cases the requirements to meet such claims are detailed in EMC.1 to EMC.3

Assessors are reminded of the need to adopt a proportionate approach to the assessment of structural integrity cases. The gross failure of certain structures, systems and components (SSCs), though undesirable from an availability perspective, may have limited implications for nuclear safety. In these cases a degree of nuclear safety protection is offered and there should be a commensurate reduction in the requirements of the structural integrity demonstration, reflected in the safety classification. This should be reflected in the failure frequency, though the integrity case should be primarily based on established engineering practice as embodied in design codes[37].

EMC.5 refers to a demonstration that safety-related components and structures are both free from significant defects and are tolerant of defects. The definition of a defect is covered in paragraph283, the key word being *significan*t. Note that the requirement to avoid significant defects covers both those that are structurally significant and those that might impede subsequent examination. A structurally significant defect in terms of defect tolerance is a crack-like defect which is judged to be a threat to the integrity of an SSC *at some stage in the plant life*. This threat should be judged by comparing the margin between the sizes of defects of structural concern (as derived from the fracture assessment) with the results of manufacture, pre-service and in-service examinations (paragraph317).

The twin concept of defect avoidance and defect tolerance underpins the philosophy of high reliability claims under EMC.1. The linkage between the defect of structural concern and the screening undertaken by examinations[38] is also crucial to high reliability claims. EMC.1 and EMC.5 therefore seek the same goals, but EMC.1 strives for a rigorous demonstration commensurate with a high reliability claim.

[35] referred to in paragraph 284 as a *general lack of adequate reliability data for the disruptive failure of metal components and structures*

[36] This is consistent with guidance in DNP CoP no.3

[37] From which a nominal failure frequency might be inferred

[38] Noting that NDE does not constitute a deterministic case that defects > qualified size are absent, but can underpin confidence based on process control and qualification

3.e Engineering Justification - Ageing and Degradation

Engineering principles: ageing and degradation	Safe working life	EAD.1
Engineering principles: ageing and degradation	Lifetime margins	EAD.2
Engineering principles: ageing and degradation	Periodic measurement of material properties	EAD.3
Engineering principles: ageing and degradation	Periodic measurement of parameters	EAD.4
Engineering principles: ageing and degradation	Obsolescence	EAD.5
Associated SAP Paragraphs	214-217 and 220	
Associated Reading	DNSR TAG D007 – Management of Ageing in Defence Nuclear Programmes	

DNSR Specific Guidance to Assessors

Ageing and degradation mechanisms have the potential to undermine confidence in the delivery of safety functions and maintenance of defence in depth. The management of ageing and degradation is a key aspect of the periodic safety review process and is closely linked with the achievement of Authorisation Conditions 15 and 23. The Authorisee should show that threat from ageing and degradation mechanisms has been considered and the risks managed. This includes demonstrating knowledge of the type and rate of degradation mechanisms, and where appropriate, linking this knowledge to the control of plant parameters to manage the threat. It also includes provision for monitoring for the unexpected. For the plant as a whole this is achieved by a policy of maintaining an adequate margin between the intended operational life and the predicted safe working life of SSCs (EAD.1, EAD.2 and paragraph214).

A corollary is that an adequate margin between the operating conditions (normal and emergency) and a limiting condition needs to be maintained throughout the plant life. The limiting condition is derived from the loading and material properties and an adequate margin is one that is not negated by, for example, uncertainty in the loading, defect size, material properties, rate of degradation or a combination of these factors; it is not possible to assign a specific margin that is adequate for all situations. Again, to ensure a proportionate approach, the safety classification and failure mode should be taken into account in formulating judgments on the adequacy of these margins. Target margins in a particular case should therefore be derived from the safety classification, the level of uncertainty in the parameters and the failure mode.

The management of the integrity of the RPV belt line is an example of where material properties, in particular fracture toughness, are degraded through life due to irradiation embrittlement. This risk is managed by gaining knowledge of the material properties, the rate of degradation and defining a safety margin to ensure that the risk of brittle fracture is managed to a level commensurate with a high-integrity requirement.

Principles EAD.3 and the associated guidance in paragraphs 215-217and 220 cover the periodic measurement of material properties. Paragraph 215 highlights the need to establish the level of uncertainty at the start of life, and paragraphs 216 and 217 provide guidance on surveillance and testing which are linked to confirming that the margins in the safety case are adequate. Where a component forms a principal means of ensuring nuclear safety the regulatory expectation is that the periodic measurement of material properties

under EAD.3 is achieved by testing representative samples. Thus for a RPV or other component where the Authorisee claims incredibility of failure (IoF), a materials surveillance programme is required to monitor the rate of degradation and to allow material properties to be established throughout the operational life and as part of any case to extend the operational life beyond the designed life ie. plant life extension (PLEX).

For a modern plant, the regulatory expectation is that the lead plant should have a materials' surveillance programme using representative materials for an SSC designated by the Authorisee as IoF and some designated as high integrity. Additional surveillance programmes may be required for subsequent plant if the materials and manufacturing processes or operating conditions are judged to be significantly different from those of the lead plant. It is the responsibility of the Authorisee to identify and justify departures from this ideal situation.

For legacy plant, it should be demonstrated that alternative arrangements are in place to provide the data to a level of confidence commensurate with the integrity claim or safety classification. Where there is uncertainty eg. from use of accelerated testing or reading across data from other plant, this needs to be considered and reflected in the assumptions used in the safety case and in setting the operating margins.

The rate of degradation may be dependent on the control of certain plant parameters eg. temperature, fluidity and dose rate are important parameters which influence the rate of irradiation embrittlement and subsequent fracture toughness properties of RPV steels. Principle EAD.4 identifies the need for these to be periodically monitored to enable an accurate prediction of the material condition to be made.

Further guidance on Ageing and Degradation is provided in DNSR TAG D007.

3.f Engineering Justification - Materials Control, Welding and Inspection

Engineering principles: integrity of metal components and structures: highest reliability components and structures	Safety case and assessment	EMC.1
Engineering principles: integrity of metal components and structures: general	Defects	EMC.5
Engineering principles: integrity of metal components and structures: design	Providing for examination	EMC.8
Engineering principles: integrity of metal components and structures: design	Weld positions	EMC.10
Engineering principles: integrity of metal components and structures: manufacture and installation	Materials	EMC.13
Engineering principles: integrity of metal components and structures: manufacture and installation	Techniques and procedures	EMC.14
Engineering principles: integrity of metal components and structures: manufacture and installation	Control of materials	EMC.15
Engineering principles: integrity of metal components and structures: manufacture and installation	Contamination	EMC.16
Engineering principles: integrity of metal components and structures: pre- and in-service examination and testing	Examination	EMC.27
Engineering principles: integrity of metal components and structures: pre- and in-service examination and testing	Margins	EMC.28
Engineering principles: integrity of metal components and structures: pre- and in-service examination and testing	Redundancy and diversity	EMC.29
Engineering principles: integrity of metal components and structures: pre- and in-service examination and testing	Qualification	EMC.30
Associated SAP Paragraphs	303, 305, 308 and 317	

DNSR Specific Guidance to Assessors

Principle EMC.10 is one of several principles covering the requirement for defect avoidance and concerns the positioning of welds to take account of stress and the environmental conditions. The guidance at paragraph 305 expands on specific issues and indicates that in some situations eg. the RPV belt line welds should be relocated to avoid the threat posed by the environment. The guidance at paragraph 305 is illustrative of the type of issues DNSR inspectors or assessors need to consider.

Historically for the NRP, environmentally accelerated corrosion has proved to be a significant degradation mechanism and so the positioning of welds in regions where there is the potential for local environments should be avoided where reasonably practicable. The need to consider access for in-service examination should also be taken into account as a design activity in the location under Principle EMC.8

Welding inevitably gives rise to some level of residual stress in the weld, heat-affected zone and adjacent parent material. Welding also has the potential to introduce several types of defect. These defects in conjunction with the imposed stresses may pose a threat to structural integrity. Welding defects may also provide conditions where there is a risk of defect propagation by a degradation mechanism. Welding is a difficult operation with some techniques. For example TiG and manual metal arc welding require a high level of manual skill. The control of welding operations is therefore a key requirement of meeting the design intent.

Environmental considerations are important (e.g. high temperatures that can cause creep, or water chemistry than can lead to stress corrosion cracking), but there are several other measures associated with the control of welding operations which are of equal importance to achieving quality and avoiding defects. These measures include, but are not limited to the following: welder qualification, procedural qualification, qualification test pieces, pre and post weld heat treatments and in process examinations. These may feature in meeting the intent of Principles EMC.13 to EMC.16.

The control of materials in EMC.15 is another principle aimed at defect avoidance. Control of the materials used in fabrication is based on the effective implementation of QA procedures which cover identification, storage and issue. Storage arrangements are particularly important in welding where the threat of contamination and moisture needs careful management to ensure weld quality. Certification, chemical analysis and marking are also important aspects of the control of materials. Examples include the tight control of chemical composition necessary to limit the effects of irradiation damage to RPV steels, and the control of carbon in austenitic stainless steels to prevent sensitisation during welding and subsequent vulnerability to stress corrosion cracking. Adequate arrangements for the marking and storage of materials are also relevant to the archiving of materials (see interpretation on ageing and degradation).

Examination during manufacture is part of a package of measures including build records, QA, material procurement, testing etc. which collectively provide assurance of the achievement of the required standard of manufacture. Principle EMC.27 draws attention to the importance of deploying reliable examinations to underpin build quality and to screen out structurally significant defects during manufacture and at any subsequent stage in the plant life including pre-service and in-service examination (paragraph 308). The importance of demonstrating the absence of defects of structural concern through linking the fracture assessment to the results of examinations is emphasised in Principle EMC.28. The reference to reliability in Principle EMC.27 is to ensure that the examinations can indeed detect and size defects to a level of confidence commensurate with the integrity claim. The demonstration of the reliability of examinations is the aim of EMC.30 which covers inspection qualification.

DNSR inspectors and assessors should adopt a proportionate approach in implementing these measures taking cognisance of the safety classification. However, for a modern plant where the Authorisee identifies an IoF failure mode, a regulatory expectation is that at least one screened inspection for defects of structural concern should be carried out as part of the pre-service inspection (PSI)[39], particularly if access to the location is precluded during service. Start of life inspections should also be made to provide a fingerprint for locations identified for in-service inspection (ISI). The comparison between the pre-service and in-service examination results is a crucial part of demonstrating knowledge of degradation rates and their management to support high reliability claims.

[39] Or agreed alternative inspection

The value of redundant inspections sought under EMC.29 needs to be placed in the context of the reliability target sought. Redundant inspections through repeat independent inspections are principally designed to compensate for random effects that may result in the failure to detect significant defects. Diversity of inspection is designed to counter common-mode or systematic failure to detect defects. Compliance with the code requirements offers a degree of redundancy and diversity in examinations, but, dependent on the integrity claim and the difficulty of the examination, there may be a need to go beyond code requirements.

For example in the absence of the deployment of at least one qualified inspection at the PSI stage, the dismissal of redundant inspections at different stages in build will only increase the risk of a structurally significant defect entering service. As noted above this position will be exacerbated if access restrictions preclude ISI through-life so the cost of repeat inspections would need to be weighed against the potential resources associated with maintaining the through-life SJ.

Paragraph 317 emphasises the importance of linking the defects of structural concern as derived by the fracture assessment to the results of both pre-service and in-service examinations carried out under EMC.27. In principle, the fracture assessment should be carried out prior to the specification of the examination requirements, but the extent to which this can be done will depend on the knowledge of the loading and materials properties. For components where high reliability is sought, the aim is to achieve defect avoidance and the intent is to achieve a component that is as defect-free as possible under Principle EMC.1.

A proportionate approach (see the comment against EMC.5 and paragraph 303) is therefore required. However, even for lower structural integrity classifications where at least one line of protection is available it would not be commensurate with the need to prevent accidents and demonstrate ALARP to place a component into service in situations where the reasonably foreseeable defect size from manufacture or a real defect was commensurate with the structurally significant defect size. This risk is usually managed by meeting code acceptance criteria, or by undertaking a specific fracture assessment.

3.g Engineering Justification - Purpose and Limitations of Commissioning

Engineering principles: commissioning	Commission testing	ECM.1
Engineering principles: maintenance, inspection and testing	Type-testing	EMT.3
Associated SAP Paragraphs	196, 197, 199, 205 and 307	
Associated Reading	IAEA Safety Standard – SSG-28	

DNSR Specific Guidance to Assessors

The commissioning tests should demonstrate that, as built, the design intent claimed in the safety case has been achieved and collect baseline data for equipment and systems for future reference (paragraph 196) .It is to be expected during the commissioning of a complex plant that there may be some surprises in the characterisation of its performance (not to be confused with design errors). To minimise the frequency and significance of surprises and improve the diagnosis of their cause, a staged commissioning programme should be adopted with component and sub-system test and characterisation at appropriate points in the build programme. Allowance must be made in the programme for the feedback of plant level performance characterisation established during commissioning into operating documentation. This stage can introduce a last-minute delay to getting the plant into service; however it is a vital safety-related task, and the assessor should check that suitable time and resource allowance has been made to cover this.

Commissioning requirements must be driven by the design safety case, as they can only be identified by a full understanding of the design intent. The plant designers are responsible for specifying the requirements and the commissioning stages to confirm the design intent and achieve the required plant characterisation. They are also responsible for ensuring that the staged commissioning can be effected safely with suitable arrangements, and for specifying temporary monitoring arrangements to be implemented at plant level, when required. The assessor should therefore expect to see a linkage between the design bases and substantiations and the commissioning trials specified. The arrangements needed to ensure safety during commissioning are the responsibility of the plant builder, though the designers may assist with recommendations.

Commissioning may be used to confirm some aspects of the design intent, though it is much more effective when effected at component and sub-system level. Plant level commissioning at its most limited will demonstrate only that start-of-life (SoL) functional requirements are met. Commissioning should never be considered as a fall-back to identify errors in the design; robust processes must be in place to drive these out during the design process, and the discovery of a design error during commissioning should be considered a serious failure which will substantially delay commissioning while the error is corrected, the root cause investigated, and the plant re-characterised.

Testing is not the same as commissioning as plant characterisation is not the intent, but it is often carried out within the same programme slot for practical reasons, particularly at component and sub-system level. Testing outside normal operating conditions may be driven by:

- compliance with design codes;
- calculated conditions when the plant is operating in permitted abnormal modes;
- calculated conditions for accident scenarios within the design basis.

Designers are responsible for specifying tests at component, sub-system and plant level, and for ensuring that design substantiations cover test as well as operating conditions to support

safety during the testing operation. Again, the assessor should expect to see a clear linkage between the design bases and substantiations and the tests specified.

EMT.3 refers to type-testing prior to installation aimed at demonstrating that systems, structures and components (SSC) important to safety will meet their specification and reliably deliver their safety functions. Type-testing covers a wide range of testing related activities which are applied to demonstrate:

a) that there are no inherent design faults that could adversely affect performance, life or reliability;
b) that the manufacturer's production processes, including testing, setting-up and QA, are satisfactory;
c) stability when subjected to various influencing factors such as supply voltage, temperature and humidity changes, electromagnetic interference;
d) evidence that the specification is met.

Fatigue or endurance testing under a normal operating profile is a good example of type-testing, though one which is not often carried out in the NNPP due to the small number of units involved. DNSR assessors should note that the principle is relevant to normal operating service which may not necessarily be the same as design basis.

Type-testing also covers proof (or pressure) testing and so is linked to paragraph 307 covering the integrity of metal components. Proof testing accords with the best practice embodied in established codes and standards. However, for metal pressure vessels, pipework and systems the guidance in paragraph 307 cautions against the confidence that can be gained from passing such tests. While proof testing is an important test of the strength properties of the materials and section thicknesses, it has limitations for the assurance of the absence of crack-like defects of structural concern. Similarly, paragraph 205 infers that it is frequently not possible to test components under the most onerous in-service conditions prior to installation. DNSR assessors should be aware of the limited value of type/proof testing in such cases, and should note that code compliance may be a necessary but not complete condition for acceptance. They should establish that the design authority has identified the most onerous in-service and fault conditions, the point in the component's or system commissioning or life cycle this is first tested, and any subsequent inspection required.

The execution of commissioning at sites often remote from the design authority (DA) needs to be managed by a competent organisation including DA and operator representation as well as experienced builders and dedicated commissioning engineers. The assessor should pay particular attention to the build authority's management arrangements to check that a satisfactory commissioning organisation is planned and put in place at the appropriate times.

IAEA Safety Standard No. SSG-28 is commended to assessors and Authorisees as a guide to commissioning nuclear power plants. The particular circumstances applicable to the NNPP need to be taken into account in applying these guidelines.

4. DESIGN BASIS ANALYSIS

Engineering principles: external and internal hazards	Design basis events	EHA.3
Engineering principles: external and internal hazards	Frequency of initiating event	EHA.4
Engineering principles: external and internal hazards	Design basis event operating states	EHA.5
Engineering principles: external and internal hazards	Analysis	EHA.6
Engineering principles: external and internal hazards	'Cliff-edge' effects	EHA.7
Fault analysis: general	Design basis analysis, PSA and severe accident analysis	FA.1
Fault analysis: design basis analysis	Consequences	FA.7
Associated SAP Paragraphs	245, 607, 626-637, 639, 640 and 643	

DNSR Specific Guidance to Assessors

Conservative design, good operational practice and adequate maintenance and testing should minimise the likelihood of faults. Nevertheless, faults, incidents and events may still occur and plant must be capable of tolerating them. Nuclear plants must therefore be designed to cope with, or be shown to withstand, a wide range of disruptions without unacceptable consequences by virtue of the plant's inherent characteristics or safety measures. This is known as the design basis.

The design basis analysis (DBA) should be used to inform and support the plant design, which may well be an iterative process. The DBA would be expected to provide information on a variety of plant operational issues, as described in paragraph643. A suitably conducted DBA would, for example, demonstrate whether or not the safeguards available against a particular design basis hazard are sufficient and where additional or improved protection is necessary.

It should be noted that in accordance with FA.7, the consequence element of the DBA is to be performed on a conservative basis. Conservatism would usually be applied to parameters including decay heat level, release fractions and failure probabilities of claimed safeguards. Initiating event frequencies (except natural hazards) should, however, be established on a best-estimate basis (see paragraph 629).

Internal and external hazards need to be included in the DBA, dependent upon the consequences and frequency of occurrence.

Further requirements for DBA are given in the ONR SAP at paragraphs 626 to 643.

5. DESIGN FOR SAFETY

5.a Design for Safety - Consistency with Function

Engineering principles: pressure systems	Flow limitation	EPS.2
Engineering principles: safety systems	Avoidance of spurious actuation	ESS.22
Associated SAP Paragraphs	276	
DNSR Specific Guidance to Assessors		

The aim of EPS.2 is to limit the consequences of postulated breaches in piping systems that are connected to or from branches off the primary pipework by the provision of flow limiting devices. Flow limiting devices include isolation valves as well as flow restrictors. The supporting text (paragraph 276) provides guidance on the positioning and reliability of such features, but also seeks assurance that the protection claims are soundly based and that the fitment of a flow limiting device does not undermine the system integrity eg. by dynamic loading or water hammer. A pipe branch is usually sized for its duty, so the fitting of a flow restrictor may not be a practicable option if delivery of a safety function[40] is compromised.

For the NNPP, this is one of a package of measures which may be used to improve LOCA protection. Other measures may include, for example, minimising pipe diameters[41] or operating pressures, and improving make-up capacity. The DNSR assessor should adopt a wider interpretation of EPS.2, and take cognisance of other design features which may meet the intent of minimising the consequences of postulated breaches from the primary circuit.

For the NRP, the phrase *main pressure circuit*, first and foremost is associated with the primary circuit, though the concept of limiting consequences of failure should also be considered in the design of the secondary steam pipework where for example an excessive steam demand accident (ESDA) provides a direct threat to nuclear safety.

Principle ESS.22 highlights the importance of avoiding spurious operation which may degrade safety. In terms of nuclear safety the principle is aiming to minimise spurious tripping whilst trying to maximise protection. Spurious tripping puts the plant through unnecessary additional transients and can potentially leave the plant in abnormal modes. Additionally, there is a human factors concern where the operators may not respond properly when a real trip occurs if they have been previously subjected to a number of spurious ones. The principle should be automatically satisfied if the trip settings are specified correctly and the system has adequate reliability.

The SAP are only concerned with nuclear safety, but this principle is very important to managing the safety of the NNPP where there is a requirement to balance nuclear safety with nuclear powered warship safety, and the DNSR assessor will be conscious of this.

[40] Or indeed an operating function
[41] Consistent with function

5.b Design for Safety - Safety Systems

Engineering principles: safety systems	Provision of safety systems	ESS.1
Engineering principles: safety systems	Safety system specification	ESS.2
Engineering principles: safety systems	Dedication to a single task	ESS.19
Engineering principles: safety systems	Avoidance of connections to other systems	ESS.20
Associated SAP Paragraphs	10, 395, 399, 414, 415 and 630	
Associated Reading	IAEA Safety Standard – SSR-2/1	

DNSR Specific Guidance to Assessors

The introductory paragraph to this section of the SAP (paragraph 395) notes that Safety Systems are the highest category of plant equipment. In this context plant equipment is systems that provide a specific function rather than individual structures or components. The SAP glossary is generally consistent with IAEA Standard, SSR-2/1(Safety of Nuclear Power Plants: Design). SSR-2/1 identifies that for plant equipment, Safety Systems and Safety Related Systems have equal importance. Safety Related systems scopes all plant equipment whose malfunction or failure could lead to radiation exposure but is not a safety system (which acts in response to a fault to prevent or mitigate a radiological consequence).

The requirement for safety systems should be determined from early design stage analyses of the plant. The supporting text to SAP ESS.2 (paragraph 399) states that the design basis and probabilistic safety analyses (PSA) should determine the safety provisions, functions and required reliabilities. For the NNPP to date, analyses such as PSA are typically not carried out at the design stage but later in life when the design has been frozen and cannot therefore influence the design. This Principle states how the safety system requirements should be derived. For new designs, the DNSR assessor should ensure that appropriate analyses are conducted early in the design stages where their outcome can have the greatest influence on the selection of safety provisions and thus lead to risks that are ALARP.

ESS.19 states: *A safety system should be dedicated solely to the provision of its allocated safety function*. Although this should be the design goal, paragraph 414 recognises that this may not always be achievable, and it might be particularly difficult for a NRP. The SFAIRP argument (paragraph 10 of the SAP) should be used to justify where this Principle is not met. In such cases, the whole system should be classified as a safety system irrespective of the classification of secondary functions.

To maintain integrity of safety systems, ESS.20 states that connections between a safety system and a system external to the plant should be avoided. The intent of this Principle is to prevent failures of the external system propagating to the safety system. For example, power range testing external instrumentation may be connected to the safety system during commissioning but all failure modes should be shown to have no effect on the safety system's functions. Paragraph 415 acknowledges that this may be impractical and advises that the function of these external systems should be restricted in function and should have adequate isolation features. Again, the SFAIRP argument should be used to justify where this Principle is not met.

Paragraph 630, at the Fault Analysis section of the SAP, states: *Correct performance of safety-related and non-safety equipment should not be assumed where this would alleviate the consequences*. This essentially states that if a system may be used to alleviate the consequences of a safety system failure, it should also be classified as a safety system. If it is of a lower classification (non-safety system), the fault analysis should assume that it will not perform as intended.

5.c Design for Safety - Monitoring and Control

Engineering principles: reactor core	Monitoring of parameters important to safety	ERC.4
Associated SAP Paragraphs	556	
DNSR Specific Guidance to Assessors		

The Reactor Core section of the SAP includes ERC.4 (Monitoring of parameters important to safety). In this context *parameters important to safety* refers to the safety parameters of the core.

With regard to in-service monitoring, the DNSR assessor should review the set of instrumentation provided to monitor in-core conditions. If in-core instrumentation is so limited as to preclude any direct measurement of core parameters important to safety, the assessor should check that this omission is supported by a SFAIRP argument. In such cases it would be reasonable that the provision of alternative indirect systems that detect consequential changes within the plant are provided. These may include sensors external to the core, including fission product and gamma monitors.

6. ROLE OF OPERATOR

Engineering principles: human factors	Allocation of safety actions	EHF.2
Engineering principles: human factors	Identification of actions impacting safety	EHF.3
Associated SAP Paragraphs	404, 405, 447 and 633	
DNSR Specific Guidance to Assessors		

The role of the operator for a nuclear powered warship plant has important differences from that of a static land-based plant. At sea, many operator actions will be aimed at restoring a level of power output to protect nuclear powered warship safety, or even continue the mission. Alongside, greater operator intervention may be required to compensate for protection systems that have been optimised for the at-sea situation. The nuclear powered warship operators and plant managers may also find themselves without immediate access to design or safety authority support; they are unusually highly educated and trained operators in order to prepare them to make autonomous decisions when necessary. For these reasons blanket adherence to some of the provisions in SAP and TAG would be inappropriate (e.g. the 30 minute rule[42]).

In considering the role of the operator in an emergency, DNSR assessors should consider:

- The information available to the operator. This should include both the presentation of plant information from instrumentation and the sources of operating advice and guidance that are available in the likely scenario being considered. Assessors should caution against presumed access to detailed guidance from shore authorities for at-sea events.
- The level of training and education of operators (and managers). This should consider the whole of the SQEP resource available in the scenario under consideration, bearing in mind that this will be different at sea from alongside. The scope and content of the training and education should also be considered to ensure that it is comprehensive and appropriate to both the plant and the situations that are reasonably foreseeable. Where appropriate guidance is given, and this is routinely examined (eg. response to emergency operating procedures (EOPs) during simulator and at-sea training), it is reasonable to take credit for operator action as part of the overall protection of the naval plant
- When alongside with SQEP support available, the “operator” should also be taken to include additional resource available either from the Naval Base, or through deployable backup (eg. The Nuclear Accident Backup Support Team (NABUST)). For sequences that have time for responses to be formulated, assessors may take credit for the ability of the operator to mitigate potential situations without the need to fully specify what would be done by whom. This will always be a judgment but it is probably reasonable to assume that something could be done within 24 hours of resource being available. Therefore, for those locations which are remote from support, mobilisation and transport times should be taken into account.

In addition to the response to an event, assessors should also consider the role of the operator in prevention. While a nuclear powered warship power plant that requires no operator intervention to remain safe may be unrealistic, the design of the NRP should wherever possible seek to provide a benign response to transients and simplicity of operation, thus avoiding the need for rapid operator action to stay within parameters.

[42] Paragraph 344 of the SAP set this against civil nuclear power reactors

7. NUMERICAL TARGETS

Numerical targets and legal limits	Assessment against targets	NT.1
Numerical targets and legal limits	Time at risk	NT.2
Numerical targets and legal limits	Applying the targets	NT.3
Associated SAP Paragraphs	695-767	
Associated Reading	Annex 2 to SAPs 2014: Basis and Derivation of Numerical Targets	

DNSR Specific Guidance to Assessors

Assessors should note paragraph 695 of the SAP that the numerical targets are guides to inspectors to indicate where there is a need for consideration of additional safety measures. The Basic Safety Limits (BSLs) and Basic Safety Objectives (BSOs) translate the tolerability of risk framework and guide into decision making by inspectors and assessors. While the BSOs generally reflect the start of the broadly acceptable levels of dose/risk, as noted in paragraph A4 of the Basis and Derivation of Numerical Targets (SAP Annex 2), the BSOs for normal operation are set at a level reflecting that achieved by industry. The BSOs are not design targets or surrogates to denote when As Low As Reasonably Practicable (ALARP) levels of risk have been achieved. There is an overriding legal duty on duty holders to consider whether they have reduced risks to ALARP, regardless of whether the BSO has been met. The BSO represents a level below which it would not be a good use of regulatory resource, nor consistent with a proportionate regulatory approach, to generally pursue further improvements in safety.

Sufficient guidance on use of the numerical targets and legal limits is contained in SAP, the accompanying Annex 2 and the associated Technical Assessment Guides referred to in the text of theses references, with the exception of Target 6 and NT.2. Further guidance on Target 6 is detailed below and guidance on NT.2, justification and management of short term high risk activities, is in Annex C of an earlier version of JSP 518 (Issue 2, April 2004); time at risk arguments are discussed in NRPA-4-1-1.

TARGET 6

Target 6 is a subsidiary target of Target 5 and applies to a single accident in an individual facility. The original intent of this target was that it would apply to the totality of accidents at the facility that could affect any person on the site. However, such a target was considered too onerous (see paragraph A39 of the SAP Annex 2). Target 6 aims to produce a balanced approach to ensure that no single accident can make an excessive contribution to the overall site BSO and BSL of Target 5. The inspector or assessor should be assured that the fault sequence is appropriately categorised for consideration as a single accident, and not subject to excessive summation before comparison with the target, which would lead to a more onerous requirement.

The consideration of societal risk at paragraphs 752-754 is complicated during nuclear powered warship operation. Severe reactor accidents or non-availability can result in loss of the nuclear powered warship with an immediate loss of over 100 lives. Since this is unlikely to be a purely nuclear accident, the way in which nuclear ALARP is influenced by societal concerns should take account of the influence by those concerns on non-nuclear ALARP, so the targets at paragraph 754 (Target 9) are not directly applicable. However, any cost benefit analysis (CBA) applied to the evaluation of such an accident needs to take account of the full potential loss of life, not individual nuclear risk values.

The risk from the postulated nuclear incident will also need to be balanced with other sources of whole boat risk to avoid the potential for a focus on nuclear safety increasing the

risk to the nuclear powered warship. The conventional or nuclear powered warship risk to the crew from normal nuclear powered warship operations is approximately an order of magnitude higher than the achievable nuclear risk, and such risk can be exacerbated by loss of propulsion. This lacks an obvious parallel in civil nuclear operations (ie. that a loss of output can put lives at risk as effectively as a serious nuclear accident) and its implications affect many SAP covering redundancy and diversity, safety systems role of the operator, etc.

Loss of a vital strategic asset (in the case of a deterrent-carrying nuclear powered warship), and the negative impact to the UK submarine programme of any nuclear accident or nuclear powered warship loss might also be factored into the societal risk calculation, though it is likely that the latter is covered by the potential loss of life from a single mishap.

The application of Target 9 to nuclear powered warship maintenance and port visits gives rise to a different complication. Since the population density and its orientation relative to the nuclear powered warship will vary from site to site, the nuclear powered warship operating organisation could be required to achieve different safety standards at different sites. The nuclear powered warship operating organisation or Authorisee may choose instead to set dose and/or fission product release targets to meet or better the societal risk targets at paragraph 754 at the “worst-case” site which the nuclear powered warship might visit. DNSR inspectors should test the accuracy and realism of such an approach while accepting its validity in principle.

Annex J: NWR Safety Assessment Principles

Note: The NWR Safety Assessment Principles are included in their original form pending the outcome of the DNO review of MOD NW policy and principles. DNSR will continue to use the existing NWR SAPs during assessment activities.

Introduction

1. These NWR Safety Assessment Principles (SAP) are for use, in concert with applicable ONR SAP, when forming the judgements necessary to permission activities in any life-cycle phase (LCP) and agree intrinsic safety submissions in the Nuclear Weapons Programme (NWP). They are complementary to ONR SAP and cover specific issues found in NWP, providing in particular, guidance on safety attributes that should be demonstrated from the design of a nuclear warhead.

2. NWR SAP explicitly provide guidance on assessments associated with warheads. During research, development and surveillance in support of warheads and components, it is likely that activities will be conducted with "nuclear explosive like assemblies"; these may be scaled-down nuclear devices intended to allow the examination of warhead materials under conditions approached during warhead detonation. In this situation, and in common with the general use of SAP, the relevance of all SAP to the submission being assessed should be considered, applying the principles as necessary.

Structure

3. Figure J.1 shows how SAP and interpretation for the Defence Nuclear Programme are structured. The applicability of any SAP (or its interpretation) in forming a judgement is determined by DNSR staff, in discussion if appropriate with the Authorisee or Approving Authority making a submission.

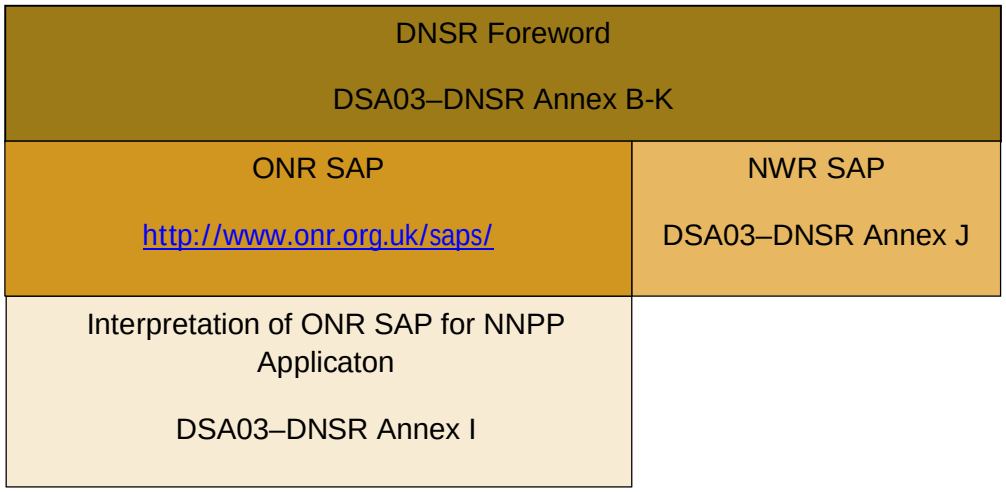

Figure J.1 SAP Interpretation

Nuclear Weapon Programme Fundamental Principles

4. The Nuclear Weapons Programme Fundamental Principles (NWPFP) are considered to be the foundation for the safety assessment principles below. They replicate the language of the Fundamental Safety Requirements stated in DSA02–DNSR.

5. All reasonably practical measures must be taken to reduce the residual risk from yield or the release of radioactive (RA) material to As Low As Reasonably Practical (ALARP), preferably via inbuilt warhead features. For guidance on the interpretation of ALARP see ONR website.

NWP Fundamental principles	Nuclear yield	NWPFP.1
Nuclear yield[43] must not occur except when a nuclear warhead is used in an authorised operational role.		

NWP Fundamental principles	Release of radioactive material	NWPFP.2
Warhead radioactive material must not be released into the environment[44] except when a nuclear warhead is used in an authorised operational role.		

Warhead Design

6. Certain warhead design approaches are of prime importance in achieving acceptable safety in the NWP. These should be used to assess the merits of the design of a warhead.

Single and Multi-Point Safety

7. The safety of a warhead would be significantly improved if the design is single point safe (SPS)[45] and this follows directly from NWPFP.1. Conceivable situations exist where the supercharge can be initiated directly, at a single point, as a result of direct abnormal stimulus rather than through the Arming, Fuzing and Firing (AF&F) System. Such explosive events may be partial, or run to detonation and, in the latter case, could compress the fissile core asymmetrically but sufficiently to reach a brief state of supercriticality for a very short period. In such circumstances, the design of the neutron initiator should ensure that it remains inoperative.

8. It is possible to conceive of situations where the supercharge is initiated at several points e.g. by a shower of fragments from a nearby explosion. Resistance to inadvertent nuclear yield would be increased if the warhead were Multi-Point Safe (MPS)[46] i.e. a design which is inherently safe in that detonation of the supercharge at multiple points in any credible scenario would not have inadvertent nuclear yield as a credible consequence.

9. At the time of writing, formal demonstrability of MPS involves an impossibly complex level of computational capability. As computational capability improves, MPS demonstrability may become more practicable.

Warhead design	Inherent safety	WHD.1
The underpinning aim for any warhead should be an inherently safe Primary design.		

10. It should be demonstrated that the warhead is SPS and MPS at all times, including during assembly and disassembly, and under any credible “situation”.

11. Any reduction in the probability or size of yield from single or multi point initiation of the supercharge is desirable.

[43] Nuclear yield is defined as a nuclear energy release greater than 2kg of TNT equivalent. The value of 2kg of TNT equivalent is selected as it is approximately the level of yield at which the prompt radiation hazard exceeds the hazard from the conventional explosive.
[44] See DSA01
[45] A WH is defined as being single point safe if, in the event of a detonation initiated at any point in the high explosive (supercharge), the probability of achieving a nuclear yield greater than 2 kg of TNT equivalent is less than 10^{-6}.
[46] In the event of unintentional detonation of the supercharge, initiated at any number of points (normally taken to be in the design mode), the probability of any nuclear yield exceeding more than 2 kg of TNT equivalent is less than 10^{-6}.

12. There should be an assessment to show that when the supercharge is subjected to insults the neutron initiator remains inoperative or that any output does not match critical timing requirements and that other neutron sources can be discounted.

13. The possibility of inadvertent initiation by stray/inadvertent neutrons should be prevented.

Explosive Composition

14. MOD Policy[47] requires the use of Insensitive Munitions (IM) which contributes to the reduction of risks to ALARP by minimising the probability of inadvertent initiation and severity of any subsequent explosive event. There are three important terms used in relation to explosive compositions:

a. Sensitivity – is a measure of how readily an explosive will respond to a design stimulus; it is not a measure of how susceptible an explosive is to accidental stimuli;

b. Sensitiveness – is a measure of how readily (not violently) an explosive responds to an accidental stimulus such as being dropped, penetrated or involved in a fire; the response could be anything from a minor fire to a detonation;

c. Explosiveness – is a term used to describe the violence or response; this can vary from no response through burning, deflagration, explosion to full detonation.

15. A warhead incorporating a supercharge, detonators and explosive trains/boosters of low sensitiveness and explosiveness would contribute towards compliance with MOD Policy and would offer significant potential benefits in relation to both NWPFP.1 and NWPFP.2. Whilst the design safety advantages may appear to be clear, use of such an explosive may pose both performance and ageing challenges. In general, explosives with lower sensitiveness and explosiveness are likely to develop less power when properly detonated; larger quantities may therefore be needed to produce the required compression of the pit. Lower sensitiveness and explosiveness may also require the use of more exotic materials whose behaviours over the lifetime of a warhead may be less well characterised. This may require a planned refurbishment with newly manufactured supercharges.

Warhead design	**Explosive composition**	**WHD.2**
The supercharge, detonators and explosive trains of warheads should be manufactured from explosive of the lowest sensitiveness and explosiveness.		

16. Attention should be given to the qualification evidence for the supercharge explosive, explosive trains and detonators. Safety analysis should support the choice of explosive.

17. It should be demonstrated that lifetime risks, including the effects of ageing, have been analysed and support the choice of supercharge explosive, explosive trains and detonators.

18. The use of explosive with low sensitiveness and low explosiveness should be encouraged, but this should be balanced by consideration of the additional risk from disassembly and reassembly should refurbishment be planned.

[47] See DSA02–OME Part 1.

19. Warhead performance requirements should not compromise safety.

20. At suitable update/upgrade opportunities, the consideration of improved IM compliance for legacy warheads should be encouraged.

Safety Analysis

21. Warhead safety, as opposed to radioactive dispersal, depends crucially upon preventing design mode initiation of the Primary and excluding stray/inadvertent energy or information compatible with initiation of detonation critical components. This, in turn, depends upon the integrity and robustness of the AF&F, its exclusion regions, its containment and the dedicated lightning protection. Inoperability, Independence, Incompatibility and Isolation (4 Is) are important. These together with a number of specific safety measures have been collectively described as Enhanced Nuclear Detonation Safety.

22. There may be other acceptable design approaches that isolate those features of the AF&F which are critical to the initiation of the warhead in its design mode and that also protect against the ingress of stray/inadvertent energy.

Warhead design	**Safety analysis**	**WHD.3**
Warhead design concepts should allow safety analysis and demonstration.		

23. The design approach should enable simplified analysis and formal demonstrability of the intrinsic safety of the warhead.

24. The design should be compliant with the 4 Is concept.

25. It should be demonstrated that those features of the AF&F, which are critical to the initiation of the Primary in its design mode, also afford adequate protection against the ingress of stray/inadvertent energy compatible with the form used for initiation.

26. There should be evidence that the warhead is “not armed” and will remain so, when assembled, transported, handled, stored, processed, deployed and disassembled.

27. Where Strong Links (SLs) are used, they should be designed on different and incompatible principles such that the possibility of common mode failure is avoided.

28. Where Weak Links (WLs) are employed, it should be demonstrated that a WL will fail in advance of a related SL when subjected to the hazard they are claimed to defeat.

29. It should be demonstrated that critical firing components are protected from stray/inadvertent energy by isolation within any claimed Exclusion Region (ER).

30. It should be demonstrated that the only access point into any claimed ER, for the correct initiating energy for the Primary, is through SL that only operate when exposed to unique “authorising” stimuli.

31. If SLs, WLs or ERs, or any combination thereof, are claimed as Full Line(s) of Defence (LODs) (see paragraph 55 below) against a given hazard, they should be demonstrated as meeting the LOD criteria.

32. Where necessary (e.g. due to the complexity of the arming system) the analysis of modes of operation and signal paths should be separated into a small number of logically independent processes so that the safety of all modes and paths can be demonstrated.

Warhead Arming State

33. SLs, WLs and ERs within the warhead may be claimed as vital in ensuring safety; consequently it is highly desirable that their integrity and status can be readily determined at appropriate times. Undetected operation of one of the SLs, represents a loss of safety, which for example, could have serious consequences if the warhead were to be subsequently involved in a "situation".

Warhead design	State monitoring	WHD.4
The warhead arming state should be able to be readily determined[48].		

34. It should be demonstrated that the integrity and status of SLs, WLs and ERs can be readily determined at appropriate times and after any departure from the normal[49] environment.

35. The operation of any "self-diagnosing" components should be demonstrated.

36. Where it is not practicable to determine the integrity and status of SLs, WLs or ERs directly, provision should be made to monitor an associated function that will give a reliable indication.

37. It should be demonstrated that any method of determining the integrity and status of the warhead arming state does not of itself prejudice safety for example by breaching ERs.

38. It should be possible to obtain internal images of the warhead (e.g. by radiography). These should be of a sufficient quality to provide evidence of the warhead safety status when combined with other measures.

Warhead Assembly and Disassembly

39. Ageing processes occurring during service can result in departure of some of the components from their "as manufactured" dimensions, compositions or other characteristics. Of particular potential concern are operations which include the handling of Primaries and supercharges; these operations should be possible without causing unacceptable stress to explosive or radioactive materials.

Warhead design	Design for assembly and disassembly	WHD.5
Warheads should be able to be assembled and disassembled safely.		

40. There should be evidence that components that could potentially affect safety are designed so that it is not possible to assemble or disassemble them incorrectly or unsafely in all configurations.

41. It should be demonstrated that warheads can be assembled and disassembled safely in all configurations that might occur during normal assembly and disassembly.

[48] Ideally using a method which allows immediate indication, rather than requiring specialist equipment

[49] The Normal Environment is that which the warhead expects to see and in which it is expected to remain safe and suitable for service. This includes any environmental insult that is predicted to occur at a frequency greater than 10^{-3} events per year.

42. It should be shown that operations which include the handling of Primaries, supercharge/explosive trains/detonators can be done without causing unacceptable stress to explosive or radioactive materials or other safety critical/hazardous materials and components within the warhead.

43. There should be measures to ensure that any ageing processes do not adversely affect safety during assembly (notably after refurbishment which reuses components) or in particular disassembly.

44. There should be arrangements to ensure that safety critical items are identified and that all aspects of their manufacture, assembly and disassembly are appropriately managed.

Surveillance

45. It will be necessary to conduct stockpile safety assessment (surveillance) to provide evidence in support of assessments of warhead life predictions and stockpile health. The evidence should also be used for the periodic review and reassessment of safety cases and safety information. Such evidence is drawn from analysis of stockpile components and materials and knowledge of the conditions that warheads have experienced.

46. Any components that are part of the planned surveillance programme, that may need to be analysed, should ideally be withdrawn from representative service warheads in a condition that facilitates analysis.

47. Information should be collected about the environments that warheads have actually experienced whilst in the logistic cycle. Sensors that are physically close to warheads, ideally integrated within them, can provide the least ambiguous information, but alternative arrangements (e.g. monitoring associated with transport or storage containers) may also prove acceptable.

Warhead design	**Surveillance**	**WHD.6**
Warhead surveillance evidence should be provided to support safety analysis.		

48. The warhead design should be such that surveillance samples can be recovered in the least damaged state possible.

49. There should be an adequate stockpile surveillance programme to support the periodic review of safety.

50. Warhead components used to support the surveillance programme should be representative of the stockpile and be undamaged during disassembly, thus enabling subsequent inspection and analysis to be undertaken.

51. It should be possible to provide information on the conditions experienced by a warhead. Sensors should ideally be built into or associated with the warhead, but without compromising safety.

Warhead Security

52. Many of the features typically built into a warhead including the overall robustness associated with the vehicle structure (e.g. those responding to only unique trajectory environments or encoded signals) can provide a significant degree of resistance to

unauthorised initiation. Other features specifically aimed at preventing unauthorised control, interference with, or initiation of the warhead may also be incorporated. Some of these features may operate by rendering the warhead permanently inoperable by a variety of methods. Security features may, however, compromise safety in themselves or pose challenging post-operation situations with the potential to affect safety. Safety should not be compromised.

Warhead design	**Security**	**WHD.7**
There should be features to prevent unauthorised arming or initiation of the warhead.		

53. There should be security features (ideally passive) that do not rely on control measures or human intervention.

54. There should be evidence that adequate security features have been provided to protect a warhead against any specified security risk.

55. Warhead security features should not prejudice, or bypass safety features or in any way detract from correct safety functionality.

Lines of Defence

56. In addition to features built into the warhead, adequate external protection of the warhead should be provided to minimise the probability of direct insults to the supercharge, explosive trains, AF&F and radioactive materials. Appropriately designed facilities, storage and transport containers and fragment barriers in magazines, storage areas and assembly facilities are some of the measures that may provide such protection in any situation where exposure to such hazards might possibly occur. If the measures provide adequate protection to the warhead against yield and RA release they may be considered as LOD during that particular configuration or scenario.

57. A LOD may be a physical/engineered item or procedure that either reduces the probability of a particular hazard happening or protects against the consequence of a hazardous event.

58. A LOD may be effective against a variety of hazards/environments or against only one. LOD may be characterised as:

a. Full LOD - It should either be demonstrated that the probability of failure on demand is less than 10^{-3} or substantive evidence provided that at least this level of protection has been achieved. It should be qualified, redundant or automatic. It is not permitted to aggregate a Full LOD that is better than 10^{-3}, with a LOD that fails to meet the requirements of a Full LOD, to make two Full LOD;

b. Physical/Engineered or Procedural – depends on whether they rely on physical/engineering features or on human adherence to specified instructions. Engineered LODs are preferred over procedural; and

c. Active or Passive - depends on whether the protection afforded relies on the system responding actively or passively to the hazard to provide the protection. Passive LOD are preferred over active LOD.

59. Specific circumstances associated with a “situation” or accident cannot be predicted accurately and the response will depend on the hazards created and the associated risk.

60. If it is judged that the Primary retains a credible capability of producing inadvertent yield then the immediate response should be to restore, as far as possible, 3 Full LOD to prevent yield and LOD as appropriate to prevent the release of RA material.

Lines of defence	Defence against yield	LOD.1
There should be full lines of defence to prevent unintended nuclear yield.		

61. There should be at least three, demonstrably independent Full LOD to prevent unintended nuclear yield.

62. The three LOD, which should function independently, should ideally be passive physical/engineered LOD. The number of LOD that are built into the warhead should be maximised.

63. If a procedural Full LOD is claimed, there should be substantial human factors evidence to justify its status.

64. Where a Full LOD relies on a combination of SL and WL, it should be demonstrated that the WL fails safe before the SL operates or any ER(s) fail unsafe.

65. There should be evidence that a Full LOD is effective against the hazard/environment for which it is qualified.

66. Where tests are not statistically significant to provide comprehensive evidence to qualify the LOD, qualitative evidence and soundly based engineering judgement may be considered.

67. Evidence should be provided to show that each LOD functions independently from all other LOD against a specific hazard/environment. If any common cause failure mechanism of two LOD cannot be shown to be at least unlikely[50] and ideally very unlikely[51], then only one of them can be attributed.

Lines of defence	Defence against release of radioactive material	LOD.2
There should be full lines of defence to prevent release of radioactive material.		

68. There should be at least three, demonstrably independent Full LOD to prevent an inadvertent major release of RA material[52].

69. There should be at least two, demonstrably independent Full LOD to prevent a significant release of RA material[53]

70. There should be at least one, Full LOD, with an objective of two, to prevent a minor release[54] of RA material[55].

[50] Unlikely means probability (events per demand or consequences per insult) $\leq 10^{-3}$.
[51] Very unlikely means probability (events per demand or consequences per insult) $\leq 10^{-6}$.
[52] A major release of RA material could give a Plutonium release or equivalent effect (as fully respirable aerosol) of >30kg.
[53] A significant release of RA material could give a Plutonium release or equivalent effect (as fully respirable aerosol) of 3g to 30kg.
[54] A minor release of RA material could give a Plutonium release or equivalent effect (as fully respirable aerosol) of <3g.
[55] It is not intended that this be applied where high pressure gas (eg. tritium) permeates its containment as a result of the physical nature of gas and container.

71. There should be evidence that priority is given to the prevention of major and significant releases of RA material rather than a minor RA release.

Warhead Arrays

72. Placing groups of unprotected (or lightly containerised) warheads arranged in close proximity presents a possibility that detonation of the supercharge in one warhead could produce sympathetic detonation in others through blast or fragment impact. Arrangements should therefore minimise the possibility by limiting the number of warheads that can be placed together and wherever possible barriers or some other system should also be incorporated. Any situation where bare (e.g. not significantly protected by containers or barriers) warheads are stored, transported, handled or processed in close proximity to each other needs careful attention.

73. In addition to the RA dispersal hazards, a nuclear safety hazard known as "popcorning"[56] can arise if the sequence of sympathetic detonations were to occur where the warheads are arranged in close array. A warhead Primary, unboosted and without neutron initiation, should not compromise the SPS, and additionally, no interaction between neighbouring warheads including sympathetic detonation and neutron arrival should lead to overall compromise of the SPS criterion for the array taken as a whole.

Warhead arrays	**Sympathetic detonation and "popcorning"**	**WHA.1**
Arrays of warheads should be arranged so that sympathetic detonation and "popcorning" is minimised.		

74. Arrangements for arrays of warheads including procedural controls for storage, handling, transportation and processing should:

a. limit the number in any array;
b. wherever practicable incorporate barriers to prevent sympathetic detonation; and
c. provide evidence that the possibility of popcorning has been minimised.

75. Proposed arrays of warheads should be configured such that, in the event of a series of single-point detonations, the probability of nuclear yield exceeding 2 kg TNT equivalent should be less than 10^{-6} for the whole array, given that the initiation has occurred. If a calculation to this effect is not presented, there should be qualitative evidence that the risk from popcorning has been reduced to ALARP.

Logistic Issues

76. The fitment of components, essential to the design-mode functioning of the warhead, as late as possible in the logistic cycle can enhance safety and security, for example boosting material and neutron initiators might not be fitted during transportation on public roads or whilst warheads are in store. Other warhead components (especially

[56] The phenomenon whereby neutrons from one accidental detonation of a nuclear WH can enhance the potential nuclear yield of a nearby accidentally-detonating WH. Popcorning can occur only when there is a relationship between the detonations, which depends in turn on the geometry of the WH array.

associated with the AF&F) are likely to be essential in maintaining safety and security as soon as the warhead is assembled. Decisions in this context could be finely balanced and should be supported by safety cases and comprehensive ALARP considerations including safety, security and the overall risk in the NWP as well as to operators at sites.

Logistic issues	**Component fitment**	**LOG.1**
Components should be fitted into the warhead as late as practical in the logistic cycle.		

77. Boosting material, neutron initiators and any other features which facilitate or enhance the production of yield should not be fitted or be made ineffective for as much of the warhead life cycle as possible. They should normally be held separate from the warhead until they are required to be fitted to meet operational requirements.

78. Evidence should be provided in safety cases or ALARP arguments that safety, security and overall risk in the NWP has been given the appropriate consideration and that the approach taken to component fitment complements logistic, maintenance and operational requirements and minimises the radiological risks to the workforce.

Numerical Targets

79. Safety cases should be assessed to judge the extent to which numerical targets have been achieved. The targets are for accident conditions and are guides in judging whether the nuclear and radiological safety is being managed adequately and how far risks have been reduced to ALARP. The targets are used to inform decisions on whether additional safety measures are needed. The targets are not mandatory.

80. Activities undertaken during certain LCP are likely to be spasmodic and only occupy a fraction of the calendar year, however it is considered appropriate to apply the same targets for each LCP rather than apportioning targets to individual LCP.

81. The expression of targets and the way they should be interpreted is as presented in ONR SAP.

Frequency of unintended yield	**NW Target 1**
The target for the frequency of unintended nuclear yield from all warheads in a life-cycle phase is 10^{-8} per year.	

82. Target 1 is stated as a single figure, in effect a Basic Safety Level (BSL). It is not practicable to achieve a convincing quantitative demonstration of frequencies below 10^{-8} per year; consequently no Basic Safety Objective (BSO) is specified but it should be demonstrated that the frequency of unintended nuclear yield is ALARP. A single BSL value is applicable for all levels of yield above a nominal 2kg TNT equivalent because there are difficulties in accurately predicting the magnitude of yield events.

Individual risk to the public from accidents	**NW Target 2**

The targets for the predicted frequencies of accidents which could give an effective dose at 1km are:

Effective dose mSv		**Total predicted frequency per annum**	
		BSL	BSO
< 0.1		n/a	n/a
0.1	1[57 58]	10^{-1}	10^{-4}
1	10	10^{-2}	10^{-5}
10	100	10^{-3}	10^{-6}
100	1,000	10^{-4}	10^{-7}
1,000	10,000	10^{-5}	10^{-8}
10,000	100,000[59]	10^{-6}	10^{-9}

83. Target 2 reflects the perceived enhanced public concern associated with nuclear weapons[60] and the corresponding BSO has been set at a factor of 1000 below the BSL. The rationale is that it is considered to be reasonably achievable and when the BSO has been met, the loss of one LOD will not result in the risk being above the BSL.

84. Target 2 is the risk of activities with warheads in each life-cycle phase of the NWP and is irrespective of the number of warheads present.

85. During assembly or disassembly, a warhead is considered to exist for risk estimates when radioactive material can be dispersed by a reaction of the supercharge. ONR SAP Target 8 applies to all activities in the assembly/disassembly facilities and NWR SAP Target 2 applies additionally to activities with warheads.

[57] Indicates the effective dose from a minor release at 1km.
[58] A significant release is defined as any release that results in an effective dose between that from a minor and a major release.
[59] Indicates the effective dose from a major release at 1km.
[60] Reference: Risk: Analysis, Perception and Management. Report of a Royal Society Study Group pages 103-104, dated Oct 2001.

Annex K: DNSR Technical Assessment Guides

List of DNSR Technical Assessment Guides (at April 2021)

Latest versions are available electronically on the DNSR Sharepoint site. Alternatively, copies are available from DNSR on request.

TAG Ref	Title
TAG/D001	Emergency Arrangements
TAG/D002	Operational Berths
TAG/D003	Lines of Defence
TAG/D004	Hydrodynamic Experiments
TAG/D005	Numerical Targets 1 & 2
TAG/D006	See Note 1
TAG/D007	Management of Ageing in Defence Nuclear Programmes
TAG/D008	Radioactive Discharges
TAG/D009	Radioactive Material Transport Package Approval
TAG/D010	Control of Lifting Operations
TAG/D011	Safety Analyses and Safety Case Interfaces
TAG/D012	High Reliability Due Process
TAG/D013	Through Life Safety (in preparation)
TAG/D014	Commissioning
TAG/D015	Permissioning
TAG/D016	Structural Integrity

Note 1: DNSR Guidance on INY provided in AWE Report 52/12

Annex L: Legislation

Introduction

1. A comprehensive framework of legislation exists to ensure that the UK's civil nuclear programme and DNE achieve acceptable standards of health, safety and environmental protection (HS&EP).

2. Activities within the DNE generally work within this legislative framework, but are subject to a number of disapplications exemptions, or derogations (DEDs) which take account of the purpose of the MOD and its objectives (principally the availability of military capability to support delivery of defence tasks), and the physical environment in which the DNE operates. The following paragraphs provide an overview of the principal legislation applicable to nuclear and radiation safety and environmental protection in the UK and British Overseas Territories. The general application of the legislation to the DNE is described and the regulating authority is identified. Nothing in this Annex affects the responsibility of an Authorisee for complying with applicable legislation.

3. Where Defence has specific DEDs (or provision so for) against relevant HS&EP legislation, and hence where DNSR has associated policy and Defence Regulations, these are identified in Table K.1 below, and described in the appropriate section.

Legislation	Specific DED for Defence	Provision for Specific Defence DED
Health and Safety at Work Act 1974		
The Energy Act 2013 (TEA13)		
Nuclear Installations Act 1965 (NIA)	✓	
Atomic Weapon Establishment Act 1991 Amendment Order 1997	✓	
Ionising Radiation Regulations 2017 (IRR17)	✓[Visiting Forces]	✓
Radiation (Emergency Preparedness and Public Information) Regulations 2019 (REPPIR)	✓[Visiting Forces]	✓
Justification of Practices Involving Ionising Radiation Regulations 2004		
The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (as amended)	✓	
Environmental Permitting (England and Wales) Regulations 2016 (EPR16) (Amended 2018)	✓	
Environmental Authorisations (Scotland) Regulations 2018	✓	
The HASS Directive	✓	
Nuclear Reactor (Environmental Impact Assessment of Decommissioning) Regulations 1999 (as amended)	✓	✓
Visiting Forces Act 1952		

Table L.1 – Key HS&EP Legislation Relevant to the DNE

Legal Framework in the UK

4. In UK, legislation provides the fundamental basis of safety practice. It is legislation, through an Act of Parliament or subordinate legislation, brought into force by a Secretary of State (SofS) that requires a regulatory body to be set up and provides the basis for its regulatory powers. It defines the limits of these powers and is likely to indicate some guiding directions for its implementation. Increasingly, UK legislation reflects the UK's international commitments and agreements, most notably arising from former membership of the EU.

5. The detail of regulatory requirements is frequently expanded through codes of practice, guidance to the regulations, and associated documents published by bodies such as the Health & Safety Executive (HSE). Guidance can also be set out in formal statements of Government policy (White Papers) or in statutory guidance issued to regulators. However, it is legislation which provides the overall basis of regulatory provision.

6. The SofS for Defence may, in the interests of national security, by a certificate in writing, exempt certain defence activities and premises from the requirements of certain Regulations.

Definitions

7. There are a number of terms used in legislation and associated guidance and agreements to describe defence nuclear sites:

> TEA13 refers to ***GB Nuclear Sites***, which *'means a nuclear site in England, Wales or Scotland'*.
>
> The ONR/HSE Inter-Agency agreement that transfers HSWA enforcing Authority from HSE to ONR under TEA13 uses the term ***Defence Nuclear Site***:
>
> *'For the purposes of this Agreement, "defence nuclear site" means a site: (a) for which there is in force a valid authorisation granted by, or on behalf of, the Secretary of State having responsibility for defence authorising its use for the carrying out of any nuclear related activity; but (b) which is not a nuclear warship site (within the meaning of the Health and Safety (Enforcing Authority) Regulations 1998).'*[61]
>
> ***Authorised Defence Site*** is a legally defined term under the Health and Safety Enforcing Authority Regulations 1998 (HS(EA)98):
>
> *'....means a site in England and Wales or Scotland - (a) that is used for any purpose for which, if section 1 of the NIA65 applied to the Crown would require the authority of a nuclear site licence in respect of that site; and (b) for which there is in force an authorisation granted by or on behalf of the SoS having responsibility for defence authorising it to be used for that purpose'.*
>
> In terms of the HS(EA)98, sites that are Authorised Defence Sites are also Defence Nuclear Sites for the purpose of H&S Enforcing Authority. It should be

[61] Agreement Under Section 13(3) of the Health and Safety at Work etc. Act 1974 and Section 90(1) of the Energy Act 2013. 14 April 2015.

noted that ‘Authorised’ has a meaning in law, but ‘Authorisation’ does not (that is MoD policy).

A ***Nuclear Warship Site*** is what DNSR would refer to as an ‘Operational Berth’. The significant difference is that HSE is the HSWA enforcing authority, not ONR (the HS(EA)98, as amended by TEA13, defines as such).

Relevant Legislation – Health and Safety

Health and Safety at Work etc. Act 1974

8. The Health and Safety at Work etc. Act (HSWA) introduced a framework for safety legislation and its enforcement, establishing the Health and Safety Executive (HSE). HSWA is an enabling act for subordinate health and safety legislation. The HSE has statutory responsibilities under the HSWA and its subordinate regulations. Equivalent responsibilities on GB nuclear sites are now delivered through the Office for Nuclear Regulation (ONR).

9. There is no general Crown exemption from the HSWA and MOD is bound by the general duties it imposes and by regulations made under it, except where specific exemptions apply. DSA 01.1 sets out the arrangements by which MOD complies with the HSWA, and the MOD/HSE General Agreement describes how the Act is implemented in practice.

The Energy Act 2013

10. Part 3 of the Energy Act 2013 (TEA) came into force on 1st April 2014, and formally established ONR as an independent regulatory body with powers and responsibilities to regulate the safety of nuclear installations, as well as to deal with civil nuclear security, transport of radioactive materials (other than for MOD purposes) and the UK’s compliance with international safeguards. Certain sections of the NIA are now relevant statutory provisions of TEA rather than HSWA. TEA binds the Crown (except where stated otherwide in specific provisions) but has limited relevance to MOD other than to give ONR full powers on all GB nuclear sites (including Authorised sites) under all aspects of HSWA that were previously held by HSE.

Nuclear Installations Act 1965 (As amended by The Energy Act 2013 and The Nuclear Installations (Liability for Damage) Order 2016)

11. The Nuclear Installations Act (NIA) restricts the operation of specified nuclear installations (including nuclear reactors) to bodies licensed for that purpose by ONR. Licensees are then regulated through a set of 36 Licence Conditions (LC) designed to ensure that adequate standards of nuclear safety are maintained. The NIA also establishes licensees’ strict liability for any harm or damage arising from their activities.

12. The Crown (i.e. MOD) is exempt from the NIA, although Section 9 of the Act applies the liability provisions referred to above as though the Act does apply. Reactors in a means of transport (which include operational Nuclear Powered Warships’ (NPW) reactors) are also specifically disapplied from the Act. The NIA does apply where MOD is not in direct control of activities, for example at the Atomic Weapons Establishment (AWE) and Devonport Royal Dockyard Limited (DRDL), and thus the sites are Licensed by ONR which has statutory responsibilities under the NIA. For MOD duty holders who would require a nuclear site license were it not for Crown exemption from the NIA, DNSR regulates via the process of Authorisation, including the application of Authorisation

Conditions which generally mirror to ONR Licence Conditions, thus enabling regulation with equivalent provisions.

Atomic Weapons Establishment Act 1991 Amendment Order 1997

13. The Atomic Weapons Establishment (AWE) Act 1991 Amendment Order 1997 has provision for Licensing by ONR, but excludes application of the Licence Conditions to the extent that such conditions affect the design of a nuclear device or any other device (other than a nuclear reactor) intended to simulate the properties of a nuclear device[62]. Hence, for nuclear weapon design through life, and for those activities on AWE sites that would otherwise be subject to licence conditions under the NIA were it not for the disapplication, DNSR regulates via Authorisation.

Ionising Radiations Regulations 2017

14. The Ionising Radiations Regulations (IRR17) sets out detailed provisions for radiation protection, including prior risk assessments, dose limitation, As Low As Reasonably Practicable (ALARP), the appointment of Radiation Protection Advisers, dosimetry etc. JSP392 (Radiation Safety Handbook) sets out the corresponding MOD policy. The Regulations are applicable to MOD, and are regulated on UK nuclear sites and Operational Berths by ONR. Outside the UK, DNSR applies equivalent provisions so far as is reasonably practicable.

15. The regulations include provision for SofS for Defence to exempt in writing HM Forces, visiting forces, or any person engaged in work with ionising radiation for, or on behalf of, the SofS, in the interests of national security[63].

16. The SofS for Defence has exempted in writing foreign NPWs visiting the UK in accordance with IRR17.

Radiation (Emergency Preparedness and Public Information) Regulations 2019

17. The Radiation (Emergency Preparedness and Public Information) Regulations 2019 (REPPIR) set out detailed provisions for emergency preparedness and response in relation to holdings of large quantities of radioactive material, including hazard evaluation and consequence assessment, operators' and off-site emergency plans, tests (i.e. exercises) of those plans, and the provision of prior information to the public.

18. REPPIR applies to all relevant activities on DNE sites, but does not specifically apply to the transport of radioactive materials or radioactive substances contained within Type B and C transport packages. However, Regulation 22 relates to emergencies (however they may arise), which includes reference to transport emergencies; other requirements for transport radiation emergencies, including prior information, are included in CDG.

19. REPPIR is regulated by ONR. DNSR acts as Competent Authority in this regard, providing assurance to ONR that the detailed NRP and NW design information contained within the hazard evaluations and consequence assessments is valid and has been used appropriately. Outside the UK, DNSR applies equivalent provisions so far as is reasonably practicable.

[62] This is further interpreted in the MOD/ONR General Agreement
[63] See IRR 17 Regulation 40

20. Without a time limit, the SofS for Defence has exempted from REPPIR in writing foreign NPWs visiting the UK[64].

21. Regulation 25 of REPPIR (Modifications relating to the Ministry of Defence) allows the Secretary of State for Defence to make exemptions in the interest of national security from all or any of the requirements or prohibitions imposed by REPPIR.

The Justification of Practices Involving Ionising Radiation Regulations 2004

22. These Regulations (as amended by the Justification of Practices Involving Ionising Radiation (Amendment) Regulations 2018) implement an EU Directive requirement for any new class or type of practice resulting in exposure to radiation to be justified by the benefits arising in relation to any corresponding health detriment. Such determinations are made by the Justifying Authority (i.e. the devolved administrations for devolved subject areas, and the appropriate Secretary of State in relation to subject areas which have not been devolved). For the purpose of these Regulations, a new class or type of practice is one that was not undertaken within the UK before 6 February 2018, the date on which the requirements of the Directive became effective. A class or type of practice is also new if it was carried out in the UK before 6 February 2018, but was in breach of a requirement not to carry out a practice of that class or type until that class or type has been found to be justified. There is also provision for an existing practice to be reviewed in the event that new and important evidence about its efficacy or consequences is acquired.

23. Associated guidance[65] emphasises the principle underlying the Directive (and thereby the Regulations) that justification is to be applied generically rather than at the level of individual uses of a practice, and would therefore relate for example to the delivery of the NNPP and NWP as a whole. Since both of these broadly stated practices were carried out prior to February 2018, and were not in breach of a justification requirement, the Regulations have no practical impact on the programmes subject in principle to the following two provisos.

24. Substantial design or other changes sufficient to alter the overall balance between the benefits and detriments of the programme could in principle require a new justification decision.

25. Similarly, new and important evidence about the efficacy or consequences of the programme could in principle require a new justification decision.

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (and as amended)

26. These Regulations set out detailed provisions for the transport of radioactive material, mainly by reference to international regulations for the carriage of dangerous goods by road[66] and by rail[67]. The Regulations apply to MOD but include wide-ranging exemptions in respect of instruments of war (as defined), which have the effect of largely disapplying the Regulations in relation to the transport of defence nuclear material. Regulatory responsibility for the transport of radioactive (class 7) materials is split between the SofS for Defence (for defence nuclear material) and ONR (for non-defence

[64] "Exemptions from UK Legislation in Respect of Visiting Forces" SofS Certificate of Exemption dated 30 September 2006 issued under reference MSU 3/3/10S dated 2 October 2006.

[65] The Justification of Practices Involving Ionising Radiation Regulations 2004, Guidance on their Application and Administration, Department for Business, Energy & Industrial Strategy, May 2019

[66] The European agreement concerning the international carriage of dangerous goods by road (ADR)

[67] Regulations covering international carriage of dangerous goods by rail (RID)

nuclear material). DNSR acts as the Competent Authority on behalf of the SofS for Defence. DNSR regulates the transport of defence nuclear material which is exempt from the Regulations using equivalent provisions, including acting as the Competent Authority for the approval of packages to be used for such transport.

Relevant Legislation – Environmental Protection

Environmental Permitting (England and Wales) Regulations 2016 (EPR16) and Environmental Authorisations (Scotland) Regulations 2018 (EA(S)R)

27. In England and Wales EPR16 applies, whilst in Scotland EA(S)R applies.

EPR16 (Amended 2018)

28. Specific requirements for radioactive substances activities are laid out in Schedule 23 of EPR16. Whilst the Crown is bound by the EPR16 regulations generally, it is not bound by the Schedule 23 provisions in relation to a radioactive substances activity when carried out on premises occupied on behalf of the Crown for defence purposes or occupied by visiting forces. Nevertheless, the MOD has voluntarily committed to ensuring equivalent compliance with the provisions of EPR16.

29. Schedule 23 does apply where MOD is not in direct control of activities, for example at AWE and Devonport Royal Dockyard Limited (DRDL). Regulation in England is by the Environment Agency (EA)[68].

30. The meaning of 'radioactive substances activity' as defined in Schedule 23 does not apply to certain such activities conducted by a licensee of a nuclear site[69]. This is because NIA65 delivers many of the regulatory requirements for radioactive substances on sites licensed under NIA65. Likewise, the DNSR Authorisation Conditions (which mirror the Office for Nuclear Regulation (ONR) License Conditions (LCs)) attached to site licenses granted under NIA65) deliver equivalent regulatory requirements for radioactive substances activities on Authorised sites.

31. DNSR has therefore chosen to regulate the relevant Defence DEDs from EPR16 relating to the following activities via its ACs, in the same way that ONR regulates these activities through the LCs:

- Keeping and use of sealed sources;
- Keeping and use of radioactive material;
- Accumulation of radioactive waste.

32. The principal ACs through which the equivalent requirements are delivered are:

- AC7 Incidents
- AC25 Operational Records
- AC32 Accumulation of Radioactive Waste
- AC33 Disposal of Radioactive Waste
- AC34 Leakage and Escape of Radioactive Material and Radioactive Waste

[68] Note – from 1 April 2013, Natural Resources Wales (NRW) took over the functions previously carried out by the Environment Agency (EA) in Wales.

[69] However, nuclear site licensees do require an environmental permit for disposal of radioactive waste, and for the keeping or use of mobile radioactive sources

33. The EPR16 definition of ‘radioactive substances activities’ does apply to disposal of radioactive wastes, which is therefore regulated by EA for licensed sites. For MOD operated sites (for which EPR16 Schedule 23 does not bind the Crown), the EA regulates disposal of radioactive wastes on DNSR’s behalf in accordance with agreed administrative arrangements[70].

34. The discharge of radioactive material from Nuclear Powered Warships (NPW) direct to the environment is excluded from the administrative arrangements agreed with EA and is instead regulated by DNSR in accordance with the requirements of Further Authorisation Condition (FAC) 3. DNSR has responsibility for regulating liquid and gaseous discharges direct to the environment from NPW under FAC 3, including the issue of consents to discharge.

EA(S)R

35. In Scotland, EA(S)R applies, and is regulated by SEPA. Schedule 8 relates to Radioactive Substances Activities. MOD activities on Crown sites or premises occupied by visiting forces, are not subject to the Regulations, as defined in Provision 78, Crown Application. MOD has agreed to comply with the provisions of EA(S)R by administrative arrangements. The arrangements are broadly similar to those described above for EPR16.

36. The EA(S)R definition of ‘radioactive substances activity’ in Schedule 8 does not include any activity involving radioactive material carried out by a licensee on a nuclear site[71]. The keeping and use of radioactive material on a nuclear licensed site is regulated by ONR under NIA. For MOD Authorised non-licensed sites[72], regulation is by DNSR under provisions equivalent to NIA (i.e. the relevant ACs, as described above). By agreement, between MOD and SEPA, management and disposal of radioactive waste on Authorised sites is regulated through parallel administrative arrangements implemented by SEPA, which would have been required by EA(S)R and its applicable guidance were it not for the Crown exemption.

37. The agreement with EA SEPA also excludes from consideration the very low level discharges of liquid and gaseous radioactive waste from NPWs directly to the environment. Again, regulation is by DNSR using equivalent provisions under FAC3.

[70] See MOD/EA General Agreement.

[71] However, licensees do require a SEPA permit for the management of radioactive waste and for the long-term storage or disposal of radioactive waste.

[72] Including the Laid Up Submarines (LUSM) in the Rosyth basin, which are treated as an Authorised site

The High Activity Sealed Radioactive Sources and Orphan Sources (HASS) Directive

38. In England, Wales and Scotland these regulations are fully embodied within EPR16 and EA(S)R, respectively. The HASS Directive sets out detailed provisions for the registration, management and control of high-activity sealed radioactive sources (as defined). The Regulations apply to MOD and related duty holders to the extent that EPR16/EAS(S)R applies, either statutorily or by agreement (see above). Regulation is by EA in England and Wales, and SEPA in Scotland. In the case of radioactive material held on a licensed site, again ONR regulates under the NIA[73]. For MOD-Authorised non-licensed sites DNSR regulates under provisions equivalent to the NIA[74].

Nuclear Reactor (Environmental Impact Assessment of Decommissioning) Regulations 1999 (as amended)

39. The Nuclear Reactor (Environmental Impact Assessment of Decommissioning) Regulations (NR(EIAD)R) set out provisions requiring an environmental impact assessment to be carried out prior to beginning the decommissioning of a nuclear reactor, and submission of the assessment to ONR for agreement for the work to proceed. The Regulations are applicable to defence contractors that are licensees although there is provision for the SofS for Defence to exempt on a case-by-case basis projects serving national defence purposes. The Regulations are not applicable to defence Authorisee Crown controlled sites. DNSR will regulate nuclear reactor decommissioning projects on defence Authorisee Crown controlled sites (and any such project undertaken by a defence licensee in the event of SofS disapplying the Regulations) via equivalent provisions[75].

Relevant Legislation – Visiting Forces

40. There are a number of pieces of legislation that govern the use of UK berths by NPW of other nations, including:

a. Visiting Forces Act 1952: Defines Visiting Forces and acknowledges customary International Law. In essence Visiting Forces are exempt from UK domestic legislation under state immunity.

b. IRR17: SofS for Defence has exempted visiting forces from the provisions of IRR99 as permitted under regulation 40(2).

c. REPPIR19: The Secretary of State has exempted visiting forces from the provisions of REPPIR as permitted under regulation 25(2).

41. Notwithstanding statutory exemption, within UK, DNSR regulates berths and facilities that support visiting NPW as though they were occupied by a UK NPW but does not extend this to the vessel itself.

Overseas

42. In November 2010, a Treaty was signed between the Republic of France and the UK related to joint radiographic/hydrodynamic facilities, the NWP is developing the appropriate relationship. A Memorandum of Understanding (MOU) was subsequently signed between DNSR and the French safety regulator, Autorité de Sûreté Nucléaire et à

[73] For mobile HASS (as defined in the Regulations) located on nuclear licensed sites, the enforcing authorities are EA in England, NRW in Wales and SEPA in Scotland

[74] Including the making and furnishing to DNSR of such records relating to HASS as DNSR may specify under AC25

[75] Provisions under development at the time of issue of this publication

la radioprotection pour les activités et installations intéressant la Défense (ASND). in respect of their separate and joint responsibilities for safety regulation of the TEUTATES Programme. The Authorisation Certificate for AWE identifies nuclear activities undertaken at locations in France made available to AWE under Government to Government arrangements. This certificate also includes nuclear activities undertaken at locations in the United States of America made available to AWE under Government to Government arrangements.

Glossary of Selected Terminology

This section provides a glossary of the meaning of selected terms as used specifically in regulatory documents. Where the DSA01.4 definition differs from the DNSR definition they are referenced as footnotes after the word being defined. The source of DNSR's definitions, where relevant, is referenced after the definition, or part thereof. Where possible, DNSR aligns terminology with external RGP e.g. ONR, IAEA.

Term	Explanation
Accident	Any unintended event, including operator errors, equipment failures or other mishaps, the consequences or potential consequences of which are not negligible from the point of view of protection or safety.
Agreement.	An Agreement issued by DNSR allows an Authorisee to proceed With an agreed course of action.
ALARP	Abbreviation for achieving risk that is As Low As Reasonably Practicable. The commonly used variant of the legal term So Far As Is Reasonably Practicable. ALARP and SFAIRP mean essentially the same thing and at their core is the concept of "reasonably practicable"; this involves weighing a risk against the trouble, time and money needed to control it. The requirement for risks to be ALARP is fundamental and applies to all activities within the scope of the Health and Safety at Work (etc) Act 1974 (HSWA).
Approve	The action used throughout the Conditions (AC, FAC and TC), with the purpose of freezing arrangements and giving permission to proceed. Once DNSR Approval is given to a set of arrangements, they must not be changed or varied unless and until the changes have been agreed by DNSR.
Arming, Fuzing and Firing (AF&F)	Warhead (WH) control system responsible for correct arming, when authorised, and which maintains safety in other circumstances. The AF&F constitutes a major component of the nuclear WH safety chain.
Assurance	The action taken to report to another party that the specified arrangements, organisation, situation or activities are in place in accordance with expectations. The process includes monitoring, audit, inspection and sampling, but excludes direct involvement to alter or take responsibility for specific actions or decisions. This does not preclude the ability to instruct operations to cease.
Audit	A documented activity performed to determine by investigation, examiniation and evaluation of objective evidence the adequacy of, and adherence to, established procedures, instructions, specifications, codes, standards, administrative or operational programmes and other applicable documents, and the effectiveness of their implementation.
Authorisation	A regulatory mechanism through which DNSR-Hd sets the Conditions permitting an Authorisee to establish their own safety arrangements whose adequacy must be demonstrable to the satisfaction of the DNSR.
Authorisation Certificate	A certificate provided by DNSR-Hd defining the scope of activities Authorised and the locations in which they may be undertaken.
Authorisation Conditions	Those obligations that are applied by DNSR-Hd as a condition of being Authorised to conduct specified activities in relation to the Defence Nuclear Enterprise (DNE).
Authorised Site	A defined site within which nuclear activities are controlled by an Authorisee in compliance with the Authorisation Conditions,Further Authorisation Conditions and Transport Condition.
Authorisee	The accountable post-holder identified on the Certificate of Nuclear Authorisation, duly Authorised by DNSR-Hd to operate in compliance with the Authorisation Conditions, Further Authorisation Conditions and Transport Condition. The role of Authorisee cannot be delegated to any other person, in whole or in part, formally or informally.
Authorisee with Design Authority Responsibilities	The accountable post-holder identified on the Certificate of Nuclear Authorisation, duly Authorised by DNSR-Hd to operate in compliance with the Authorisation Conditions, Further Authorisation Conditions and Transport Condition. The role of Authorisee with Design Authority

Term	Explanation
	Responsibilities cannot be delegated to any other person, in whole or in part, formally or informally.
Authority	DNSR-Hd is charged with Authorising the conduct of defined activities that may entail a direct or indirect risk to nuclear safety, and with providing assurance that the requisite level of nuclear safety is being achieved.
Broadly Acceptable	A level of risk that is low enough that it should not cause particular concern to informed individuals potentially affected by it. The regulatory authorities consider that while even broadly acceptable risks should be rendered as low as reasonably practicable, in most cases it would be disproportionate to apply regulatory time to reduce them further.
Cause	The origin, sequence or combination of circumstances leading to a hazardous event.
Commissioning	The process by means of which systems and components of facilities and activities (including any nuclear weapon, naval reactor plant, component, relevant support equipment, plant or process), having been constructed, are made operational and verified to be in accordance with the design and to have met the required performance criteria.
Competence	The ability to put skills and knowledge into practice in order to perform a job in an effective and efficient manner to an established standard
Competent Authority	Any body or authority designated or otherwise recognized as such for any purpose in connection with [the Transport] Regulations. (See SSR-6 (Rev. 1)). DNSR is recognised as the Competent Authority for the Naval Reactor Plant and Nuclear Weapon by ONR.
Conditions and Limits of Safe Operation	See Operating Rule
Consent	A Consent is used to ensure an Authorisee does not carry out an activity before DNSR has been satisfied that the proposed course of action is safe and all necessary procedures and controls are in place, or that pre-requisites from a hold point control document have been met.
Consequence	The (usually undesirable) outcome deriving directly or indirectly from a hazardous event or a combination of events and circumstances.
Corrective Action Requirement	Direction from DNSR to remedy an identified shortfall in compliance with a DSA 02–DNSR requirement within a defined timeframe. The Authorisee is required to respond with a Corrective Action Plan to restore compliance.
Decommissioning	Administrative and technical actions taken to reduce hazards progressively and thereby allow the removal of some or all of the regulatory controls from a facility.
Defence	Many defence activities are conducted by contractors or partner organisations; the term “Defence” encompasses these as well as organisations within the Ministry of Defence.
Defence Nuclear Enterprise (DNE).	The Defence Nuclear Enterprise comprises the Naval Nuclear Propulsion Programme (NNPP) and the Nuclear Weapon Programme (NWP).
Defence Nuclear Material	A generic term covering nuclear weapons and Special Nuclear Materials for the DNE.
Defence Safety Authority (DSA).	DSA regulates safety and environmental protection for those conducting defence activity, be they Armed forces personnel, MOD civilians, or contractors.
Design	The process and the result of developing a concept, detailed plans, supporting calculations and specifications for a nuclear weapon, NRP, plant or facility and its parts.
Design Authority	The defined function of an identified MOD organisation with the responsibility for, and the requisite knowledge to Approve and maintain the design intent, integrity and safety of a nuclear weapon or naval reactor plant as appropriate through life.
Design Authority Intelligent Customer	Where a MOD organisation relies upon the output of a Responsible Designer, it should act as an intelligent customer by specifying requirements, supervising the work and is able to technically assess the outputs of the Responsible Designer through life.
Design Basis	The range of conditions and events that should be explicitly taken into account in the design of the facility, plant or weapon according to established criteria, such that the facility, plant or weapon can withstand them without exceeding authorised limits by the planned operation of safety systems.

Term	Explanation
Design Intent	The fundamental criteria and characteristics (including reliability levels) that need to be realised in a facility, nuclear weapon, naval reacor plant, component or relevant support equipment in order that it achieves its operational and safety functional requirements.
Design Organisation	An organisation responsible for designing a specific type of equipment. The Organisation may own the design, or pass ownership to a third party. Also referred to as a Responsible Designer.
Direction	A Direction requires an Authorisee or duty holder to take a particular action.
Disposal	Emplacement of waste in an appropriate facility without the intention of retrieval.
Diversity	The presence of two or more independent (redundant) systems or components to perform an identified function, where the different systems or components have different attributes so as to reduce the possibility of common cause failure, including common mode failure.
Dose	See Effective Dose
Duly Authorised Persons (DAP)	Suitably Qualified and Experienced Persons who are Authorised to control and supervise operations which may significantly affect nuclear or radiological safety.
duty holder[76]	A person or organisation who has direct responsibility for, and control of, activities that influence, directly or indirectly, the safety of the DNE. An Authorisee is a specific form of duty holder subject to DNSR Authorisation. In the context of DNSR regulation of the DNE, duty holder is not capitalised.
Effective Dose	The quantity obtained by multiplying the equivalent dose to various tissues and organs by a weighting factor appropriate to each and summing the products. When comparing effective doses received to annual limits the contributions from external exposure and the committed effective dose from intakes of radionuclides in the same period should be included. Effective dose is measured in Sieverts (Sv).
Emergency Arrangements	The integrated set of infrastructural elements, put in place at the preparedness stage, that are necessary to provide the capability for performing a specified function or task required in response to a nuclear or radiological emergency.
Emergency Plan	A description of the objectives, policy and concept of operations for the response to an emergency and of the structure, authorities and responsibilities for a systematic, coordinated and effective response. The emergency plan serves as the basis for the development of other plans, procedures and checklists.
Endorse	To endorse a document is to express agreement to its content. Endorsement does not apply to subsequent revisions unless these too are subject to separate assessment and endorsement.
Environment	1. The total set of all external natural or induced conditions to which a material is exposed, during a specified period of time. 2. The conditions under which people, animals and plants live or develop and which sustain all life and development; especially such conditions as affected by human activities.
Event	An event is any occurrence unintended by the operator, including operator error, equipment failure or other mishap, and deliberate action on the part of others, the consequences or potential consequences of which are not negligible from the point of view of protection of safety.
Exclusion Region	A region of the Arming, Fuzing and Firing system containing one or more critical firing devices and which is protected from stray energy by an exclusion boundary.
Explosiveness	Is a term used to describe the violence or response; this can vary from no response through burning, deflagration, explosion to full detonation.

[76] DSA01.4 definition of Duty Holder: An enhanced duty of care for personnel under command, by virtue of their involvement in the activity of a capability and an Area of Responsibility, to allow complex military activity necessary to deliver Defence Tasks does not suffer unreasonable harm or loss. Individuals are held to account for ensuring risk to life remain ALARP and tolerable, according to a delegation cascaded through the SofS and commands to three levels. Such persons are appointed according to principles and criteria as sufficiently in control to supervise operations affected by HSEP risk and duties extend beyond the normal managerial duties or line management responsibilities to integrate across DLOD.

Term	Explanation
External Hazard	Natural or man-made hazards to a site and facilities that originate externally to both the site and the process, i.e. the duty holder may have very little or no control over the initiating event.
Facility	That part of a nuclear site identified as being a separate unit for the purposes of nuclear or radiological risk. This may be a single reactor, a group of processing plants as on a nuclear fuel-cycle facility or a dock and its support systems containing a naval reactor plant. The term encompasses both the terms 'nuclear installations' as defined in the Nuclear Installations Act 1965 (as amended) and 'plant' as used in nuclear site licences granted by ONR. It also includes nuclear weapons, components and relevant support equipment.
Fissile Material	Any matter containing Uranium 233, Uranium 235 (>0.72%), Plutonium 239 or Plutonium 241, either singly or in any combination.
Further Authorisation Conditions	Conditions that address issues unique to the DNE (mobility of naval reactor plant and nuclear weapons for which there are no equivalent Licence Conditions.
Hazard	The potential for harm arising from a property or disposition of something to cause detriment.
Hold Point	A point in any project or operation in the DNE beyond which progress is prohibited until predetermined criteria which provide safety assurance or risk mitigation are satisfied.
Improvement Notice	This is a Direction from the regulator to remedy a significant shortfall in compliance or a significant safety risk within a defined timeframe. DNSR may issue an IN where non-compliance has a significant safety risk or where an Authorisee's response to a CAR is inadequate (e.g. one or more AC compliance arrangements are judged to be less than adequate and it is likely that the contravention will continue or be repeated). The Authorisee is expected to produce an agreed Forward Action Plan to close the Improvement Notice and report progress to DNSR to give confidence that the target will be met.
Incident	Any unintended event, including operating errors, equipment failures, initiating events, accident precursors, near misses or other mishaps, or unauthorized act, malicious or non-malicious, the consequences or potential consequences of which are not negligible from the point of view of protection and safety.
Independent Nuclear Safety Assessment (INSA)	INSA is a formal process of examining a safety case against appropriate objectives, standards and criteria. The scope and depth of INSA are managed to be proportionate to the risk posed by the hazard and sufficient to advise authoritatively on safety and risk, in accordance with the Nuclear Safety Classification.
Independent Peer Review (IPR)	The examination of safety justification documentation by suitably qualified and experienced persons independent of the project to consider its acceptability and completeness and whether the safety case presented is acceptable when compared to established standards and criteria. The IPR will be commissioned by the organisation responsible for making the Safety Justification. Independence can stem from the use of resources outside the department producing the Safety Justification. An IPR will be completed against well-defined terms of reference.
Inherent Safety	The ability of an Ordnance System, Munition or Explosive device to retain its safety under specified stimuli (both intended and accidental) due to the nature of its design, its safety features and material employed as an inseparable part of that system.
Insensitive Munitions	Munitions which reliably fulfil their performance, readiness and operational requirements on demand, but which minimise the probability of inadvertent initiation and severity of subsequent collateral damage to weapon platforms, logistic systems and personnel when subjected to unplanned stimuli.
Inspection	A documented activity performed to determine by examination and evaluation of objective evidence the adequacy of process, and adherence to regulatory standards.
Intelligent Customer	The Authorisee or duty holder should have the necessary expertise and capability to be able to control and supervise its contractors, so as to maintain the ultimate responsibility for safety – this is referred to as 'intelligent customer' capability. The concept of the 'intelligent customer' relates to the organisation as a whole rather than the capabilities of

Term	Explanation
	individual personnel. The Authorisee or duty holder should retain sufficient intelligent customer capability to know what is required, to fully understand the need for a contractor's services, to specify requirements, to supervise work and to technically review the output before, during and after the work.
Internal Hazard	A hazard to plant and structures that originates within the site boundary and over which the duty holder has some form of control over the initiating event.
Joined-up Regulation	The duty holder produces information once on a given topic and receives one response from one regulator, which incorporates the judgement of the other.
Licensed Site	A site in respect of which a Nuclear Site Licence has been granted by ONR under the Nuclear Installations Act 1965 (as amended), whether or not that Licence remains in force.
Licensee	The body corporate that has been granted a Nuclear Site Licence under the Nuclear Installations Act 1965 (as amended), which permits it to carry out a defined scope of activities on a delineated site.
Life Cycle Phase	A period in the life of a warhead during which management and safety responsibilities rest within one management unit.
Line of Defence (LOD)	An approach used to present a structured deterministic argument to demonstrate that sufficient protection is provided. LOD analysis is a qualitative method that critically assesses the effectiveness of control measures in preventing an accident event sequence leading to undesired consequences.
Maintenance	The organised activity, both administrative and technical, of keeping structures, systems and components in good operating condition, including both preventive and corrective (or repair) aspects.
Management Arrangements	Documented methods which describe how particular operations or activities will be controlled to meet the requirements of the Authorisation Conditions or relevant Safety Cases.
Modification	Any alteration to buildings, structures, plant, systems, equipment, processes or safety cases including any replacement, refurbishment or repairs to existing buildings, nuclear weapons, plant, components, relevant support equipment or processes and alterations to the design of nuclear weapons, plant, components or relevant support equipment through life.
Multi-Point-Safe	In the event of unintentional detonation of the supercharge, initiated at any number of points (normally taken to be in the design mode), the probability of any nuclear yield exceeding more than 2kg of TNT equivalent is less than 10^{-6}.
Naval Reactor Plant	The significant systems fundamental to the operation of the Nuclear Steam Raising Plant (NSRP). A meaning assigned to a nuclear reactor comprised in a nuclear powered warship (NPW), interpreted as if the NIA65 (as amended) applied.
Naval Reactor Plant Authorisee (NRPA)	The Internal Safety Authority for the Naval Reactor Plant, authorised by DNSR for at-sea operation of the plant, and as Approving Authority for all phases of the plant life.
Normal Environment	The Normal Environment is that which the weapon expects to see and in which it is expected to remain safe and suitable for service. This includes any environmental insult that is predicted to occur at a frequency greater than 10^{-3} events per year.
Notification	When so notified, an Authorisee or duty holder is required to submit information to DNSR. A notification is used to request the submission of information to DNSR.
Nuclear Emergency	This refers to a reactor accident, nuclear fuel accident, neutron source accident or a nuclear weapon accident, which may lead to a release of fissile or radioactive material or fission products.
Nuclear Explosive-Like Assembly (NELA)	An assembly which represents a Nuclear Explosive in its basic configuration (main charge and fissile material, or nuclear core of a gun-type weapon) and any subsequent level of assembly up to its final configuration, or which represents a weaponised Nuclear Explosive such as a warhead, bomb, re-entry vehicle or artillery shell. A NELA in any configuration does not contain an arrangement of high explosive and fissile material capable of producing a nuclear detonation.

Term	Explanation
Nuclear Matter	Subject to any exceptions prescribed in NIA and the Nuclear Installations (Excepted Matter) Regulations 1978, nuclear matter is: a. any fissile material in the form of uranium metal, alloy or chemical compound (including natural uranium), or of plutonium metal, alloy or chemical compound, and any other fissile material which may be prescribed; and b. any radioactive material produced in, or made radioactive by exposure to the radiation incidental to, the process of producing or utilising any such fissile material as aforesaid.
Nuclear Warhead	The item of hardware that arrives at the point of detonation; for the purposes of DSA02–DNSR this will be taken to mean the aeroshell and its contents.
Nuclear Weapon	A nuclear explosive configured for Ministry of Defence operational use.
Nuclear Yield	The energy released in the detonation of a nuclear warhead, usually quoted in TNT weight equivalent. In the context of this document, a yield is defined as a nuclear energy release greater than 2kg of TNT.
Observation	This is an objective statement used to highlight a perceived strength or weakness in arrangements (or an opportunity to drive improvements into them). It counts as advice and guidance and no formal response is required from the Authorisee.
Operating Instructions	Written instructions that: a. provide step by step instructions on how to carry out an operation to ensure that it is done in the way assumed in the safety case; b. ensure that operating conditions and limits are implemented; c. are necessary in the interests of safety.
Operating Rule	Any condition or limit in place at a nuclear facility or during an operation through which an Authorisee demonstrates compliance with its safety case.
Operational Berth	Any berth outside an Authorised site and not covered by an Authorised site's arrangements, which may be visited by a NPW. An Operational Berth may be in the UK, a British Overseas Territory (BOT) or a foreign country.
Operation(s)	Includes any operation involving nuclear material including, manufacture, assembly, disassembly, maintenance, examination, testing of a nuclear weapon or components or materials, operation of the naval reactor plant and the treatment, processing, keeping, storing, accumulating or carriage of any radioactive material or radioactive waste, the passage, movement and berthing of vessels and "operating" and "operational" shall be construed accordingly.
Periodic Safety Review	A comprehensive assessment of design, equipment, operations and safety cases against current standards required at appropriate intervals to demonstrate that the risks continue to be as low as reasonably practicable and that ageing and other time-related phenomena will not render the design or operations unsafe before the next review.
Permissioning	The mechanism by which DNSR regulates hazardous activities, through the imposition of formal requirements on, for example, Operators, Designers, Builders or Maintainers to gain permission before conducting certain defined activities. The term 'permissioning' is used to encompass the regulatory controls 'consent', 'approval' and 'agreement'.
Prohibit Notice	Direction from the regulator to cease an activity where there is a serious and immediate risk to safety. DNSR requires, following remedial action, justification that risk from the activity has been reduced ALARP before the PN can be lifted.
Pit	The sealed fissile component of the primary stage of a nuclear warhead.
Popcorning	The phenomenon whereby neutrons from one accidental detonation of a nuclear warhead (WH) can enhance the potential nuclear yield of a nearby accidentally-detonating WH. Popcorning can occur only when there is a relationship between the detonations, which depends in turn on the geometry of the WH array.
Primary	A core (or pit) of fissile material, normally hollow, surrounded by a supercharge of high explosive which, when initiated by detonators, compresses the core into supercritical configuration; a neutron initiator provides a timed pulse of neutrons to initiate the chain reaction, the yield

Term	Explanation
	of which may be "boosted" by prior injection of fusionable material into the pit.
Procedural Control	A formally established, documented and proven sequence of actions.
Radiation Emergency	Any event (other than a pre-existing situation) which is likely to result in any member of the public being exposed to ionising radiation arising from that event in excess of any of the doses set out in Schedule 1 (of REPPIR) and for this purpose any health protection measure to be taken during the 24 hours immediately following the event shall be disregarded.
Radioactive Material (RAM)	Material designated in national law or by a regulatory body as being subject to regulatory control because of its radioactivity. In the UK, radioactive material has the meaning given in the Environmental Permitting (England and Wales) Regulations (EPR).
Radiation Safety	An integral part of nuclear safety and requires the implementation of radiation protection measures which ensure that personal exposure arising from normal work with ionising radiation is kept to levels which are as low as reasonably practicable.
Radioactive Substance	Radioactive substance is as defined in Ionising Radiations Regulations 2017.
Radioactive Waste	Radioactive waste has the meaning assigned thereto in paragraph 3 of Part 2 of Schedule 23 to the Environmental Permitting (England and Wales) Regulations 2016.
Reactor Accident	An unexpected event which is likely to lead to, or has resulted in, a release of fission products external to the fuel cladding.
Recommendation	Statement of objective evidence used to highlight an identified weakness, or where the regulator considers there is a better method of achieving compliance with regulations, or that continuing without improvement is likely to result in non-compliance with regulations in the future. A Recommendation is formal advice that requires a response from the Authorisee, including (if adopted) a date for resolution.
Redundancy	Provision of alternative (identical or diverse) structures, systems and components, so that any single structure, system or component can perform the required function regardless of the state of operation or failure of any other.
Responsible Designer	An organisation responsible through formal arrangement for the maintenance of detailed, specialised knowledge of the design of nuclear weapons or naval reactor plant through life, and possessing an adequate capability for the design of such as required.
Risk	The chance that someone or something is adversely affected in a particular manner by a hazard.
Risk Assessment	Assessment of the radiation risks and other risks associated with normal operation and possible accidents involving facilities and activities.
Safety Case	In this document, 'safety case' refers to the totality of an Authorisee's, or duty holder's documentation to demonstrate safety. It must include a justification for the activity and demonstration of ALARP nuclear risk. A fuller definition of the requirements of a Safety Case is given in ONR TAG No. T/AST/051, "Guidance on the purpose, scope and content of nuclear safety cases".
Safety Categorisation	The categorisation into a limited number of safety categories of the functions that are required for fulfilling the main safety functions in different plant states, including all modes of normal operation, on the basis of their safety significance.
Safety Classification	The assignment to a limited number of safety classes of systems and components and other items of equipment on the basis of their functions and their safety significance. 2. The classification of safety documentation or changes according to their safety significance to meet the requirements of AC14, 20, 22 and 36.
Safety Clearance Letter	A letter issued by the NRPA signifying agreement that the nuclear risk to the public, workers and crew from initial criticality and subsequent operation of the "as-built" Naval Reactor Plant is ALARP.
Safety Criteria	The numerical values against which the calculated risks arising from activities are compared as an aid in judging whether those risks are acceptable.
Safety Justification	See Safety Case

Term	Explanation
Safety Principle	A point of accepted best practice in corporate and engineering management which is (or is to be) adopted in the pursuit of nuclear safety.
Safety System	A system that acts in response to a fault to prevent or mitigate a radiological consequence.
Sensitiveness	Is a measure of how readily (not violently) an explosive responds to an accidental stimulus such as being dropped, penetrated or involved in a fire; the response could be anything from a minor fire to a detonation.
Sensitivity	Is a measure of how readily an explosive will respond to a design stimulus. If the explosive is designed to detonate it is a measure of how readily that explosive will respond to a shock stimulus from a detonator or booster explosive. NB it is not a measure of how susceptible an explosive is to accidental stimuli
Single-Point-Safe	A warhead is defined as being Single-Point-Safe if, in the event of a detonation initiated at any point in the high explosive, the probability of achieving a nuclear yield greater than 2kg of TNT equivalent is less than 10^{-6} per event.
Site Safety Case	The documentation which demonstrates that sites and organisations supporting nuclear weapons and nuclear powered warships at various stages in their Defence Nuclear Programme life cycle maintain ALARP nuclear risk while so doing.
Special Nuclear Material	Plutonium, High Enriched Uranium (HEU) and Tritiated materials.
Specification	A Specification issued by DNSR requires an Authorisee to implement the specified arrangements. A Specification is the means by which DNSR can implement discretionary control over an Authorisee's arrangements.
Strong Link	A Strong Link (SL) is a nuclear safety device used to provide a LoD by physically isolating key elements of the warhead firing chain from energy. The device is most commonly an electromechanical device that is strong both in terms of its physical construction and the nature of the inputs required to close the safety break. Modern SLs use a 'Unique Signal' to control the closure of the 'Safety Break' transitioning the device from the safe-reset position to an enabled position. Strong Links are designed to be so physically strong that they can maintain the physical 'Safety Break' through normal and abnormal environments with an assured margin. Strong links may also be called Strong Link Safety Break (SLSB).
Suitably Qualified and Experienced Persons	Those persons whom the Authorisee, considers suitably qualified and experienced to perform duties which may affect nuclear and radiological safety.
Supercharge	In current designs of nuclear warheads, the main conventional explosive charge.
Target	A value of individual dose or collective dose set by an intelligent customer, or may be self-imposed by an operator or designer, so that in the design of new nuclear plant, nuclear weapon or component or in the planning of an activity involving radiation exposure, dose is minimised by good dose management and dose limiting values are not exceeded.
Transport	The deliberate physical movement of radioactive material (other than that forming part of a means of propulsion) from one place to another. From a regulatory perspective 'transport' comprises all operations and conditions associated with, and involved in, the movement of radioactive material; these include the design, manufacture, maintenance and repair of packaging, and the preparation, consigning, loading, carriage including in-transit storage, unloading and receipt at the final destination of loads of radioactive material and packages [from IAEA SSR-6 para 106].
Unacceptable	A level of risk that is high enough to cause serious concern to informed individuals who are subjected to it. The regulatory authorities consider that such a risk should not be permitted in normal circumstances, and only permitted in order to avert greater risks in the course of serious emergency.
Unlikely	A probability of occurrence less than or equal to 10^{-3} events per demand or a frequency of less than or equal to 10^{-3} events per year.
Very Unlikely	A probability of occurrence less than or equal to 10^{-6} events per demand or a frequency of less than or equal to 10^{-6} events per year.

Term	Explanation
Weak Link	A Weak Link (WL) is designed to fail safe or become irreversibly inoperative before SLs become potentially unsafe and failure of a WL renders the WH non-functional. The key characteristics of a WL must be carefully designed in association with SLs so that the margin between the WL 'operating' and the SL failing is significant and assured.

Abbreviations

This section provides a list of abbreviations as used specifically in regulatory documents.

AA	Approving Authority/Authorities
AC	Authorisation Condition(s)
ADA	Approving and Design Authority
ADAC	Approving and Design Authorities Conditions
AF&F	Arming Fuzing and Firing
ALARP	As Low As Reasonably Practicable
ASND	Autorité de Sûreté Nucléaire et à la radioprotection pour les activités et installations intéressant la Défense
AWE	Atomic Weapons Establishment
BR	Book of Reference
BSL	Basic Safety Level
BSO	Basic Safety Objective
CADMID	Concept, Assessment, Design, Manufacture, In-Service, Disposal
CAR	Corrective Action Requirements
CASD	Continuous at Sea Deterrence
CBA	Cost Benefit Analysis
CLOSO	Conditions and Limits of Safety Operation
CSSE	Chief Strategic Systems Executive
DA	Design Authority
DAP	Duly Authorised Person(s)
DBA	Design Basis Analysis
DfT	Department for Transport
DMR	Defence Maritime Regulator
DNE	Defence Nuclear Enterprise
DNESB	Defence Nuclear Environment and Safety Board
DNM	Defence Nuclear Material
DNP	Defence Nuclear Programme
DNRF	Defence Nuclear Regulatory Forum
DNRSC	Defence Nuclear Regulation Stakeholder Committee
DNSC	Defence Nuclear Safety Committee
DNSR	Defence Nuclear Safety Regulator
DO	Design Organisation
DOSR	Defence Ordnance Safety Regulator
DRDL	Devonport Royal Dockyard Ltd
DSTL	Defence Science and Technology Laboratory
DSEA	Defence Safety & Environment Authority
EA	Environment Agency
EAC	Environmentally Assisted Cracking
EA(S)R	Environmental Authorisations (Scotland) Regulations
ECCS	Emergency Core Cooling System
EIMT	Examination, Inspection, Maintenance and Testing
EOP	Emergency Operating Procedures
EPR	Environmental Permitting Regulations
ESDA	Excessive Steam Demand Accident
EU	European Union
FAC	Further Authorisation Condition(s)
GDA	Generic Design Assessment
GoG	Government of Gibraltar
HASS	High Activity Sealed Source
HAZID	Hazard Identification
HIRE	Hazard Identification and Risk Evaluation
HMNB	Her Majesty's Naval Base
HS&EP	Health, Safety and Environmental Protection
HSE	Health and Safety Executive
HSWA	Health and Safety at Work etc. Act 1974
IAEA	International Atomic Energy Agency
ICRP	International Commission for Radiological Protection
IM	Insensitive Munitions
IN	Improvement Notice
INES	International Nuclear Event Scale
INSA	Independent Nuclear Safety Assessment

IoF	Incredibility of Failure
IP	Intervention Plan
IRR	Ionising Radiations Regulations
IS	Intervention Strategy
ISI	In-Service Inspection
JSP	Joint Service Publication
LC	Licence Condition(s)
LCP	Life Cycle Phase
LLC	Local Liaison Committee
LOCA	Loss of Coolant Accident
LOD	Line(s) of Defence
MAA	Military Aviation Authority
MB	Management Board
MOD	Ministry of Defence
MPS	Multi-Point-Safe
NEBUST	Nuclear Emergency Backup Support Team
NBC	Naval Base Commander
NIA	Nuclear Installations Act 1965?
NNPP	Naval Nuclear Propulsion Programme
NPR	Nuclear Propulsion Regulator
NPW	Nuclear Powered Warship
NR(EIAD)R	Nuclear Reactor (Environmental Impact Assessment of Decommissioning) Regulations
NRP	Naval Reactor Plant
NRPA	Naval Reactor Plant Authorisee
NRTE	Naval Reactor Test Establishment
NRW	Natural Resources Wales
NSC	Nuclear Safety Committee
NSRP	Nuclear Steam Raising Plant
NT	Numerical Target
NW	Nuclear Weapon
NW ADA	Nuclear Weapon Approving and Design Authority
NWP	Nuclear Weapon Programme
NWR	Nuclear Weapon Regulator
NW SPSC	Nuclear Weapon Safety Principles and Safety Criteria
OB	Operational Berth
OECD	Organisation for Economic Cooperation and Development
ONR	Office for Nuclear Regulation
PSR	Periodic Safety Review
PLEX	Plant Life Extension
PRT	Power Range Testing
PSA	Probabilistic Safety Analysis/Assessment
PSI	Pre-Service Inspection
PUS	Permanent Under Secretary
QA	Quality Assurance
RA	Radioactive
RAM	Radioactive Material
R&D	Research and Development
REPPIR	Radiation Emergency (Preparedness and Public Information) Regulations
RGP	Relevant Good Practice
RPC	Regulatory Policy Committee
RPV	Reactor Pressure Vessel
RSA	Radioactive Substances Act 1993?
RSD	AMEC Regulatory Support Business Area
SAP	Safety Assessment Principle(s)
SEPA	Scottish Environment Protection Agency
SFAIRP	So Far As Is Reasonably Practicable
SFC	Single Failure Criterion
SI	Statutory Instrument
SINS	Security-Informed Nuclear Safety
SJ	Safety Justification
SMDC	Safety Mechanisms, Devices and Circuits
SNM	Special Nuclear Material
SNMR	Special Nuclear Material Requirements
SofS	Secretary of State
SOL	Start-of-Life

SPS	Single-Point-Safe
SPSC	Safety Principles and Safety Criteria
SQEP	Suitably Qualified and Experienced Persons
SSC	System, Structure or Component
Sv	Sievert
SW PT	Strategic Weapons Project Team
TA	Technical Authority
TAG	Technical Assessment Guide
TEA	The Energy Act 2013
WH	Warhead

Further Advice and Feedback – Contacts

The owner of this JSP is DSA DNSR. For further information on any aspect of this guide, or questions not answered within the subsequent sections, or to provide feedback on the content, contact:

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