Office for Nuclear Regulation

ONR GUIDE			
SAFEGUARDS TECHNICAL INSPECTION GUIDE			
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1. INTRODUCTION

1.1 The Nuclear Safeguards (EU Exit) Regulations 2019 (NSR19) (Ref. I) require operators, as defined therein, to make arrangements to comply with obligations under NSR19. ONR inspects compliance with NSR19, and also with the arrangements made under them, to judge the suitability of the arrangements made and the adequacy of their implementation.

1.2 Parts of NSR19 are prescriptive, however there are elements which are goal-setting and do not prescribe in detail what the operator's arrangements should contain, this is the responsibility of the operator. To support inspectors undertaking compliance inspection, ONR produces a suite of guides to assist inspectors to make regulatory judgements and decisions in relation to the adequacy of compliance on the site. This inspection guide is part of the suite of documents provided by ONR for this purpose.

2. PURPOSE AND SCOPE

2.1 This guide has been prepared as an aid to inspection of Nuclear Material Accountancy, Control and Safeguards (NMACS) activities at operator's sites. It is to be used by ONR predominantly in judging the operator's compliance with the requirements of NSR19. This guidance provides a framework for these inspection activities, within which the Inspector is expected to exercise their discretion and judgement. This framework is provided to facilitate a consistent approach to inspection against NSR19.

2.2 This guide also contains advice on the activities surrounding, and opportunities presented by, the facilitation of verification by the International Atomic Energy Agency (IAEA) as the international safeguards inspectorate[1].

2.3 Note that the requirements of NSR19 relate only to those activities undertaken for civil purposes. Activities for defence purposes are excluded from the UK nuclear safeguards regime.

2.4 Safeguards inspections undertaken by ONR will fall into one of two basic categories as follows;

a) **Compliance inspections** for inspection of operator arrangements delivering compliance with NSR19, e.g. accountancy and control plan (ACP) inspections;

- Accountancy focused inspections – see section 5.
- Accountancy and Control Plan (ACP) Inspection – see appendix 4
- BTC Inspection – see appendix 5
- Physical Inventory Taking (PIT) Evaluation – see appendix 2.
- Physical Inventory Verification (PIV) – see appendix 2.
- Inspections in Conjunction with ONR's Other Purposes – see section 5.
- ONR inspection and assessment activities alongside the facilitation of verification by the IAEA as the international safeguards inspectorate.
- Particular Safeguard Provisions (PSPs) Inspections (where a PSP is in force) – see section 5.

b) **Safeguards systems based inspections** which assess the adequacy of systems integral to Nuclear Material Accountancy and Control (NMAC) performance both within facilities and across sites – see appendix 3.

2.5 The guidance is for use by all inspectors in ONR undertaking nuclear safeguards inspections. The guidance does not indicate when or to what extent inspections of the

[1] There is a HOW2 process for facilitation of the IAEA which ONR inspectors can refer to.

requirements of NSR19 should be carried out as these matters are covered in ONR guidance (Ref. III) and individual inspection plans, which are aligned to safeguards regulatory strategy.

2.6 It is not anticipated that all the topics recommended for consideration by the inspector will be covered in a single inspection. Some aspects (e.g. operating and accounting records) need not necessarily be inspected on site.

2.7 Where relevant, inspectors should note that aspects of compliance with NSR19 can also be delivered by planned inspections with ONR's other regulatory purposes. For instance nuclear safety licence condition (LC) inspections (e.g. LC 4 – Restrictions on nuclear matter on site) or security arrangements inspections (e.g. those concerned with preventing theft).

2.8 General ONR inspection guidance for all disciplines on how to plan, prepare, deliver and write-up an inspection should be used in conjunction with this guidance document; General Inspection Guide (Ref. II).

3. RELATIONSHIP TO RELEVANT LEGISLATION

3.1 NSR19 requires operators to have arrangements for accountancy and control of qualifying nuclear material (QNM) in place and to provide specified information on the QNM it holds to ONR.

3.2 ONR will transmit the operator's safeguards information to the IAEA and others in line with the relevant international obligations. Information transmitted to the IAEA is in fulfilment of the obligations of the United Kingdom under the agreement between the United Kingdom and the IAEA referred to as the Voluntary Offer Agreement. Additional safeguards information is communicated in line with the obligations of other relevant international agreements as set down in the Nuclear Safeguards (Fissionable Material and Relevant International Agreements) (EU Exit) Regulations 2019(Ref. IV)

3.3 How the operator complies with its requirements under NSR19 is predominantly for them to determine. ONR must judge the adequacy of this compliance and ultimately provide assurance that all operators are compliant with NSR19. ONR carries out this function through both assessment (Ref. V) and inspection.

4. PURPOSE OF THE NUCLEAR SAFEGUARDS (EU EXIT) REGULATIONS 2019

4.1 The operator is required to have arrangements in place to demonstrate compliance with NSR19. With regards to accountancy and control, operators' arrangements must meet the requirements of Regulation 6 and the detail of Schedule 2. These arrangements should be described in an ACP (Regulation 7), and the ACP should be kept up to date (Regulation 8).

4.2 There is a requirement in NSR19, Regulation 7, for operators to produce ACPs that describe the specific arrangements and procedures required by Regulation 6 and Schedule 2 of NSR19.

4.3 Brief guidance is given below for the requirements on operators in each part of NSR19 and, thus, the features the Inspector should target for understanding and compliance during inspections.

Part 1 (Introduction - Regulations 1 and 2)

4.4 This defines the terms used in NSR19. For the purposes of NSR19, a qualifying nuclear facility means a facility (including associated buildings) in which qualifying nuclear material is produced, processed, used, handled, stored or disposed of.

4.5 Qualifying nuclear material is defined as:

a) Fissionable material specified in regulations under subsection 7 of the Nuclear Safeguards Act 2018; i.e. the "Nuclear Safeguards (Fissionable Material and Relevant International Agreements) (EU Exit) Regulations 2019" ;

b) Source material in the form of:
   i. Uranium metal, alloy or compound;
   ii. Thorium metal, alloy or compound, or;

c) Ore containing a substance from which a source material falling within paragraph 2 is capable of being derived.

Part 2 (Accountancy and control, records and the provision of information by an operator - Regulations 3 - 20)

4.6 NSR19:

a) Requires the operator to declare BTCs for a qualifying nuclear facility, including for those facilities in existence prior to the commencement of NSR19, using the relevant questionnaire shown in Part 1 of Schedule 1 of NSR19 (Regulation 3);

b) Requires the operator to send an outline programme of activities of a qualifying nuclear facility to ONR using the information described in Part 8 of Schedule 1 of NSR19. The annual outline programme of activities for the following calendar year must be received by ONR by 30 h September of each year (Regulation 4);

c) Allows ONR to impose particular safeguard provisions (PSPs) on an operator in respect of a qualifying nuclear facility. Should particular safeguard provisions be imposed on an operator, the operator must comply with the requirements of the provisions (Regulation 5). The circumstances in which this is necessary are expected to be rare and ONR will engage with operators to fully understand the implications of any imposed PSPs before applying them.

d) Requires an operator of a qualifying nuclear facility to maintain a system of accountancy and control of the relevant qualifying nuclear material in each qualifying nuclear facility (Regulation 6);

e) Requires an operator of a qualifying nuclear facility to produce, implement and comply with an ACP which sets out the accountancy and control system for the qualifying nuclear material in that facility.
   i. An operator must, unless informed in writing by ONR that the matter is, in the ONR's opinion, unlikely to be prejudicial to the maintenance of the system of safeguards (Regulation 9(2)), implement and comply with the arrangements and procedures described in the ACP. This determination would be made as a result of inspection and assessment outcomes. As an enabling regulator ONR would communicate this to the operator.
   ii. An ACP may, in rare circumstances, be approved by ONR, whereupon any changes to that ACP must thereafter be approved by ONR before implementation;

f) An operator must ensure that the operating records and accounting records for each material balance area satisfy the requirements detailed in Regulations 10 and 11;

g) Regulations 11 – 19 set out the reporting requirements, including the format and timescales, placed upon the operator. The operator should have arrangements to include meeting these requirements.

Part 3 (Exports and imports - Regulations 21 - 24)

4.7 In certain circumstances, NSR19 requires the operator to give advance notification to the ONR if any qualifying nuclear material is exported from or imported into the UK (Regulations 21 and 22).

4.8 Should there be loss or considerable delay during transfer, then the operator must send a special report to the ONR (as specified in Regulation 16) as soon as the operator becomes aware (Regulation 23). A “considerable delay” should be considered as any delay that impacts on the date of arrival at the receiving plant.

4.9 Should there be any changes in the dates for packing before transfer, transport or unpacking of qualifying nuclear material, which has been given in the notifications under Regulations 21 and 22, then the operator must inform ONR of this without delay (Regulation 24).

Part 4 and 5 (Carriers, temporary storage agents and ores - Regulations 25 - 28)

4.10 NSR19 requires that:

a) any persons / undertakings in the UK engaged, in transporting, or temporarily storage of qualifying nuclear material must have records for receipt and hand of the material (Regulation 25);

b) intermediaries involved in contracts for the supply of qualifying nuclear material must keep all records relating to the transactions performed by them (Regulation 26);

c) the operator of a qualifying nuclear facility whose principal activity is the extraction of ores must keep accounting records and details of shipments (Regulation 27) and provide an annual report to ONR on ore shipments and exports (Regulation 28).

Part 6 (Qualifying nuclear material in the form of conditioned and retained waste - Regulations 29 and 30)

4.11 NSR19:

a) States that Regulations 10 to 15 do not apply to an operator of a qualifying nuclear facility in respect of retained or conditioned waste that is stored or treated at the qualifying nuclear facility. Instead, the operator is to keep accounting records for the conditioned and retained waste which satisfy the requirements of Regulation 29.

b) Sets out the reporting requirements placed on the operator when transferring conditioned waste. The requirements on the operator are outlined in Regulation 30.

Part 7 (Qualifying nuclear facility with limited operation and exemption - Regulations 31 and 32)

4.12 A qualifying nuclear facility with limited operation is defined as:

a) A qualifying nuclear facility in which less than one effective kilogram of qualifying nuclear materials is produced, processed, stored, handled, disposed of or otherwise used; and

b) Is not a reactor, a critical facility, a conversion plant, a fabrication plant, a reprocessing plant, an isotope separation plant nor a separate storage installation.

4.13 If an operator of a qualifying nuclear facility believes that the facility satisfies the definition of a qualifying nuclear facility with limited operation they can apply to the ONR to be allowed to comply with a reporting regime with limited reporting requirements provided for in Regulation 31. The requirements of NSR19 Regulations 4, 12 to 15 and 21 to 24 do not apply to operators for whom the limited reporting regime has been granted.

4.14 ONR may impose additional requirements concerning the form and frequency of reports under Regulation 31. The operator must supply evidence to show compliance with any additional requirements imposed upon it by ONR.

4.15 Regulation 32 sets out two exemptions:

a) NSR19 does not apply to a person who holds only end products which are used for non-nuclear purposes and which incorporate qualifying nuclear material which is in practice irrecoverable;

b) NSR19 does not apply to a relevant educational institution which holds an amount equal to 0.01 effective kilograms or less of uranium or thorium where, in the case of uranium, the isotopes 235 and 233 comprise 1% or less of the total mass of uranium.

Part 8 (Civil activities - Regulations 33 and 34)

4.16 NSR19 imposes duties on the operator if the operator wishes to remove qualifying nuclear material from civil activities. Before qualifying nuclear material can be removed from civil activities, written consent from ONR must have been received. The operator must use the form set out in Part 12 of Schedule 1 to provide advanced notification to ONR of the proposed withdrawal. This application must be received by ONR at least 14 days before the day on which the qualifying nuclear material is to be withdrawn (Regulation 33).

4.17 Regulation 34 clarifies the scope of NSR19 for qualifying nuclear facilities which are partly used for civil activities. NSR19 applies to qualifying nuclear material used in civil activities but they do not apply to anything done for defence purposes within the meaning of section 70 of TEA13 (Ref. VI).

Part 9 (Communication - Regulation 35)

4.18 Regulation 35 specifies the ways in which an operator can communicate the information required by NSR19 to the ONR.

Part 10 (Safeguards equipment - Regulations 36 - 38)

4.19 NSR19 requires the operator to install suitable safeguards equipment in each qualifying nuclear facility if so requested by the ONR. ONR does not envisage routine use of its own safeguards equipment as part of regulating compliance with NSR19. If the requirement ever were to arise, the inspector should note that a PSP may impose particular requirements on an operator in relation to safeguards equipment (Regulation 36). In any event ONR would engage with the operator throughout the process of installation to ensure the equipment will achieve the desired NMACS performance.

4.20 If safeguards equipment is installed in a qualifying nuclear facility, the operator must permit inspectors to have reasonable access to that equipment. Any maintenance or calibration liabilities for ONR-owned equipment would lie with ONR.

4.21 As a general rule it is not ONR's intention to install safeguards equipment in operator facilities.

Part 11 (The ONR - Regulations 39 - 42)

4.22 This section of NSR19 outlines the activities ONR can undertake on site to assess compliance with the requirements by the operator. The ONR may:

a) Examine records kept by the operator;

b) Make independent measurements of qualifying nuclear material;

c) Apply and make use of surveillance and containment measures;

d) Observe the taking of samples at key measurement points;

e) Observe the treatment and analysis of samples and obtain duplicates of samples;

f) Verify the functioning and calibration of an operator's equipment; and

g) Make such observations or measurements as necessary to verify the accuracy of BTCs.

4.23 It should be noted that the above list has been taken from Part 11 of NSR19 and is not exhaustive. The Inspector may use their discretion to determine what is necessary in order to assess an operator's compliance.

4.24 Schedule 8 of The Energy Act 2013 (TEA 2013 Ref. VI) provides further information on the powers that inspectors have been legally authorised with.

4.25 NSR19 requires the operator, if so instructed by ONR, to send any samples of qualifying nuclear material which have been taken for ONR's use to a location specified by ONR.

Part 12 (Offences - Regulation 43)

4.26 If an operator fails to comply with Regulation 43 then an offence will have been committed.

4.27 ONR will utilise the Enforcement Management Model (EMM) (Ref. VII) to determine the response to an operator failing to comply with NSR19, including committing an offence under Regulation 43.

Part 13 (Notification to the Secretary of State - Regulations 44 - 49)

4.28 Regulations 44 to 49 govern the provision of information to the Secretary of State concerning qualifying nuclear material, non-nuclear material, equipment, and technology to which a relevant international agreement, as defined in the Nuclear Safeguards (Fissionable Material and Relevant International Agreements) (EU Exit) Regulations 2019(Ref. IV), applies.

4.29 Regulation 44 states that the Secretary of State may provide written advice if operators have relevant items that should be reported on under one or more international agreements.

4.30 Regulation 45 sets out the requirements on an operator of a qualifying nuclear facility or other person to inform the Secretary of State of the receipt, production or transfer of the relevant non-nuclear material, equipment or technology.

4.31 Regulation 46 sets out the time period for the notification and Regulation 47 requires an operator to notify the Secretary of State of any relevant change.

4.32 Regulation 48 sets out the circumstances in which Regulations 45 to 47 cease to apply and Regulation 49 sets out interpretation provisions for Part 13.

4.33 Part 13 should be considered in conjunction with the arrangements for implementing Nuclear Co-operation Agreements (NCAs) agreed between ONR and the government department, BEIS.

Part 14 (General - Regulations 50 - 56)

4.34 The final part of NSR19 is the general part and brings into effect all that is contained within the Schedules of NSR19.

5. GUIDANCE ON INSPECTION OF ARRANGEMENTS AND THEIR IMPLEMENTATION

5.1 For inspections announced in advance, it is good practice for the Inspector to provide the operator with as much information about the scope and nature of the inspection as is practicable. The exception would be unannounced inspections. This ensures that the operator is given every opportunity to provide a true and accurate demonstration of compliance.

5.2 Guidance on the types of safeguards compliance an system based inspections, identified at Section 2, is provided in the remainder of this sections and in the associated appendices.

5.3 Certain inspections will be concentrated around groups of regulations in NSR19 where there is obvious interrelation.

5.4 It is for inspectors to apply their experience and discretion to determine the extent and depth of a particular inspection, taking due account of a number of factors such as the safeguards strategy, safeguards significance, complexity and use of the qualifying nuclear material in that facility.

5.5 When planning the scope of the inspection, the inspector should consider whether the presence of an ONR Nuclear Material Accountant (NMA) at the inspection will be beneficial.

5.6 Guidance is given here on some of the key requirements. In deciding which arrangements to sample, inspectors should consider reported information, events, and previous enforcement action taken on the site or at other sites. This should include the findings of related safety or security compliance.

5.7 Where site inspection indicates that an operator's arrangements fall significantly short of the requirements of NSR19, i.e. Amber or Red inspection ratings, and especially where enforcement action appears to be warranted under the EMM, the inspector should seek advice from the ONR Inspection and Assessment Lead in the first instance.

COMPLIANCE INSPECTIONS

5.8 Safeguards compliance based inspections are those activities involving inspection of an operator in relation to their arrangements for compliance with NSR19. It is recognised that for a SHNM operator, compliance inspections would be of a reduced scope which is proportionate to the activities and material involved.

5.9 Guidance on accountancy focused compliance inspections, inspections in conjunctions with ONR's other purposes, inspection and assessment activities alongside the facilitation of verification by the IAEA and inspections of Particular Safeguards Provisions (PSPS's) is provided in the paragraphs below. Guidance on inspections associated with an operator's PIT, ACP and BTC is provided in appendices 2, 4 and 5 respectively.

Accountancy focused Inspections

5.10 Accountancy focused inspection incorporates ONR assessment and inspection of operating and accounting records, and resolving any anomalies through site inspections.

5.11 Operating and accounting records are examined to establish a correct set of data and to provide confidence to ONR that the operator has an adequate nuclear material accountancy and control system established.

5.12 The basis of an accountancy inspection is the information provided to ONR in the accounting reports (PILs, MBRs, ICRs), and the operating and accounting records. These records are formed of primary data, known as "source data", examples of which would be a measurement or a calibration result. Together, these records and reports form the starting point for the Inspector when planning the scope of accountancy focussed inspection.

5.13 As well as inspecting the information in the accounting reports, the inspector will examine the specific arrangements and procedures in place for nuclear material accountancy. This helps build overall confidence in the adequacy of the operator's nuclear material accountancy arrangements.

5.14 Those arrangements and procedures should be in compliance with NSR19. For instance:

a) The ACP for the facility should describe the relevant procedures and arrangements in place for accountancy and control of material.

b) Procedures should be internally consistent with each other, valid, have an up-to-date review or change control history and identify the appropriate responsible persons.

c) It should be possible to establish instructions, methods and quality assurance requirements claimed in procedures have been followed and whether any changes that have been made have been correctly incorporated and validated.

d) The arrangements should be readily available, up-to-date, approved by an appropriate authority, implemented on site and adequately controlled under a suitable system.

5.15 The arrangements should show awareness of the reporting requirements placed on the operator as specified in NSR19. These arrangements should make reference of the different requirements for the following, as a minimum:

a) ICR (Regulation 14)

b) MBR and PIL (Regulation 15)

5.16 The main focus of an accountancy focused inspection is on operating records, accounting records, the accounting reports, and arrangements for accountancy. The ONMACS (Ref. VIII) provides further clarity on what ONR considers to be good practice for accountancy arrangements. Of relevance are ONMACS Fundamental Safeguards Expectations 6 – 9 which describe ONR expectation regarding material measurement, material tracking, and data processing respectively.

5.17 When planning accountancy focused inspection, the inspector should work closely with the ONR NMA designated to the relevant facility/site. The NMA will inform of any unresolved anomalies, discrepancies, unusual inventory changes, trends or other questions arising from analysis of the operator's accounting reports.

5.18 Detected anomalies and discrepancies within accounting reports will be communicated to the operator as soon as possible after their detection.

5.19 ONR will utilise accountancy inspections as one way of following-up on anomalies, discrepancies, requests for amplification or clarification (Regulation 12), Special Reports (Regulation 16), and unusual inventory changes that remain unresolved. These inspections will for example allow the inspector to seek clarification where the accounting reports are difficult to understand without viewing the associated operating and accounting records.

5.20 Any operator reporting practices which have been recorded as regulatory issues on the ONR Regulatory Issues Database (RID) should also be considered during the inspection planning phase.

5.21 The inspector should aim to sample the full breadth of transaction types at a given MBA with a focus on corrections and unusual transactions. All accidental loss, accidental gain, and new measurement transactions should be included in the report sample.

5.22 Operating records are those used for capturing data at the plant level where the data originates. They should form an auditable trail to the accountancy reports. Examples of operating records include movement control documents, weight or volume records, laboratory records and power production records.

5.23 Ledgers and any subsidiary ledgers summarising inventory changes and providing the book inventory for a given period, inventory change journals, inventory change

documents and internal transfer forms are examples of accounting records which can help with verification of accountancy reports. There will be a general ledger for the Material Balance Area (MBA) and each nuclear material category.

5.24 An operator must ensure that, for each material balance area, the accounting records show all inventory changes and measurement results used to determine the physical inventory. All adjustments and corrections that have been made in respect of inventory changes, book inventories, and physical inventories should be fully auditable with the operating records and accounting reports.

5.25 The inspector should check that the accounting reports, and any other notifications received, correspond to the actual on-site conditions. Special attention should be paid where unusual inventory changes have occurred; see paragraph 5.21 above.

5.26 The information in the accounting reports should be fully auditable and consistent with the operating and accounting records. These records are vital for tracking material flow on site as not all movements will be captured in the operator's accounting reports to ONR. Movements of QNM within an MBA will not appear in accounting reports, but are still an important aspect of nuclear material control arrangements. Similarly, although Part 6 of NSR19 does not require operators to report waste handling in accounting reports to ONR, they must maintain a "stock list and accounting records" for the QNM in such conditioned and retained waste.

5.27 The operator must make available any operating or accounting records and other relevant supplementary information, upon request by the Inspector during an inspection. The inspector should make reasonable time allowances for the operator to retrieve information that may be difficult to access quickly, such as records stored on plant, or in off-site archives.

5.28 Inspectors should cross-check operator and accounting records, including for consistency with the accounting reports. The following types of information may be recorded in operating records or accounting records and could be helpful to confirm during an accountancy focused inspection:

a) Changes to the material quantity or category e.g. enrichment or weight;

b) Changes to material description code (form, container, state);

c) Date of change;

d) Type of change;

e) Information on material movement within an MBA;

f) Batch identity e.g. rebatching;

g) Number of items in a batch;

h) Origin of weight information.

i) Explanations for corrections or modifications (e.g. deletions and /or additions)

5.29 From the evidence obtained through the on-site inspection, the inspector should assess the appropriateness of the inventory change codes used and discuss the outcome with the operator.

5.30 If accidental losses, accidental gains or new measurements have been declared by the operator then the inspector should request any operating or accounting records outlining the magnitude and cause of these changes. The operator must provide this on request by the inspector. The inspector should make reasonable time allowances for the operator to retrieve information that may be difficult to access quickly, such as records stored on plant, or in off-site archives.

Inspections in Conjunction with ONR's Other Purposes

5.31 Inspections may be undertaken in conjunction with inspectors from ONR's other regulatory purposes e.g. Nuclear safety or security. The guidance in this section is aimed at all inspectors who participate in such inspections that are either safeguards-focussed or have a safeguards element. This type of inspection should be considered at the planning stages of ONR Annual Intervention Plans.

5.32 Multi-discipline ONR inspections exploit the synergies between the specialisms. For example, an inspection of the control of nuclear material on site could cover compliance inspections of both NSR19 and site licence condition 4 (Restrictions on nuclear matter on site).

5.33 Some operators, particularly where they are smaller and staff have responsibilities covering multiple disciplines, may have limited resource to facilitate inspections covering the different aspects of the specialisms.

5.34 Conversely, a multi-discipline approach may in fact limit the burden on the operator by reducing the number of inspections on site. For example a SQEP personnel's time would likely be required for both an LC 4 and safeguards compliance inspection; it may be more efficient to support a single large inspection than multiple smaller ones.

5.35 It is therefore important to consider the benefits a joint approach may have, but it is also important to consider operator resource requirements when planning interventions.

5.36 Before undertaking one of these inspections, consult the ONR "Guidance for Intervention Planning and Reporting" (Ref. III), to understand the objectives of the different inspection types and specialisms.

5.37 When planning such inspections the following points should be followed:

a) The site safeguards lead will use their knowledge and experience of the site to coordinate the safeguards input to the inspections. Ideally these will be captured in advance in the relevant inspection plan
b) The vires for all ONR regulatory purposes should be clearly communicated to those involved at the facility to be inspected
c) The technical guidance associated with the aims of the inspection (e.g. LC4) should be reviewed, differing expectations noted, and each purpose's outcomes embedded within the inspection plan

ONR inspection and assessment activities alongside facilitation of IAEA verification activities

5.38 As part of meeting the UK's international safeguards obligations, ONR must facilitate the IAEA's verification activities under the Voluntary Offer Agreement (VOA) (Ref. IX). This facilitation does not necessarily demand the presence of ONR inspectors on site, but where there is such presence it may provide opportunities for inspection against NSR19.

5.39 The guidance in this section is aimed at all Inspectors involved in facilitation of IAEA verification activities and is supplemented by a HOW2 process. Inspections during facilitation should be considered for incorporation into each of the respective Annual Intervention Plans at the planning stage.[2]

[2] There is a How2 process for IAEA Facilitation.

5.40 Prior to the IAEA inspection the Inspector should establish or confirm:

a) the scope and content of the IAEA inspection

b) that all IAEA safeguards inspectors and other officials (e.g. equipment technicians) have approval to access the site and the facility, as well as a clear understanding of where access may be restricted and/or need to be managed (e.g. for safety or security reasons)

c) the scope of the work of the IAEA under the relevant international agreement, particularly, their rights and obligations

d) the previous history of the operator with respect to international safeguards verification and ONR

5.41 When facilitating IAEA requests of operators during an IAEA inspection, the ONR inspector should at all times be cognisant that they are on a nuclear facility which is under the control of the operator and that ultimate responsibility for safety and security of the facility rests with the operator. Where an operator has to refuse an IAEA Safeguards Inspector's request on the grounds of safety or security, the ONR Inspector should seek to fully understand the reasons and should lead a pragmatic resolution process with both parties.

5.42 In terms of inspection activity during an IAEA inspection the inspector should use their judgement to:

a) Attend and facilitate understanding at both opening and closing meetings, which should be led by the IAEA, to:

i. Ensure that the scope of the inspection is clear
ii. Ensure the roles and responsibilities of all participants are clear and understood including access restrictions
iii. Ensure that the outcomes, actions (assigned and time-bound), and recommendations are clear on closure

b) Monitor operator activities in support of the IAEA inspection

i. Confirm with the operator that all activities are safe and in line with reasonably acceptable NMACS operations
ii. Ensure that the operator responds effectively to reasonable requests from the IAEA (access to certain areas of plant and information) without impacting the safety or security of the facility
iii. Note and challenge any operations that appear to fall outside safety or security acceptable practice
iv. Challenge with the operator supervisor immediately any behaviours / activities that would appear to result in clear and present danger
v. Where activities appear to be unsafe / represent poor security behaviour report these to the relevant ONR Inspector
vi. Ensure that the operator responds effectively to any relevant observations made by the IAEA and / or ONR during the inspection
vii. Ensure that the IAEA does not work outside the scope of the relevant international agreement including access and information requests
viii. Challenge requests for any activities that appear to result in danger or are outside local rules

c) Act as the UK and ONR representative with respect to outcomes of the IAEA inspection including receipt of the formal IAEA report on the inspection results and conclusions as specified in the VOA.

i. Share ONR observations with the operator in the first instance and, if appropriate, with the IAEA.

ii. Discuss the outcomes of the IAEA inspection in the presence of the operator and ensure the correct level of understanding
iii. Post inspection share the formal report from the IAEA
iv. Utilise the outcomes of the inspection to inform future ONR regulatory activities
v. Ensure follow up of outcomes of inspection and close out of issues raised
vi. Ensure LFE is shared within ONR and with the operator at close out meeting and after the inspection

5.43 During an IAEA inspection, the inspector should be aware that any observed operator shortfall reflects on ONR and the UK State Regulatory Authority as well as the operator. The Inspector should carefully consider whether any such observations should form part of the facilitation inspection or whether they would be better raised and considered separately with the operator, bearing in mind the different objectives of the ONR and IAEA with regards to safeguards.

Particular Safeguard Provisions (PSPs)

5.44 PSPs may be imposed on an operator by ONR, although the circumstances in which this is necessary are expected to be rare. Where requirements have been placed on an operator with a PSP, the ONR inspector may wish to undertake a compliance inspection to verify that the requirements in the PSP are being fulfilled.

5.45 The inspector should:

a) Examine the arrangements and procedures that are in place to demonstrate compliance with the requirements detailed in the PSP and confirm that those arrangements are implemented on site.

b) Examine the procedures for consistency, including consistency between safeguards reportable information e.g. PSPs, BTCs and ACPs. Review the procedures to establish validity, whether any changes have been made since the last review and whether the identified responsible persons are correct. Note whether instructions, methods and quality assurance requirements claimed in procedures have been followed and whether any changes that have been made have been correctly incorporated and validated.

5.46 The arrangements should be readily available, up-to-date, signed by an appropriate person and adequately controlled under a suitable management system.

SAFEGUARDS SYSTEMS BASED INSPECTIONS

5.47 Safeguards Systems Based Inspections (SBI) are inspections of systems that directly support NMACS across a site or within an MBA. The aim of a Safeguards SBI is to obtain assurance that the systems in place for NMACS are proportionate to and appropriate for the qualifying nuclear facility. It is recognised that for an operator of a qualifying nuclear facility with limited operation (SHNM) this would not be an appropriate inspection type.

5.48 Further guidance on Safeguards SBI can be found in Appendix 3

6. REFERENCES

I. THE NUCLEAR SAFEGUARDS (EU EXIT) REGULATIONS 2019

II. ONR GUIDANCE ON GENERAL INSPECTION – ONR-INSP-GD-064

III. ONR GUIDANCE FOR INTERVENTION PLANNING & REPORTING – ONR-INSP-GD-059

IV. NUCLEAR SAFEGUARDS (FISSIONABLE MATERIAL & RELEVANT INTERNATIONAL AGREEMENTS)(EU EXIT) REGULATION 2019

V. ONR GUIDANCE SAFEGUARDS TECHNICAL ASSESSMENT GUIDE

VI. THE ENERGY ACT 2013

VII. ONR GUIDANCE ENFORCEMENT ONR-ENF-GD-006

VIII. ONR GUIDANCE OF NUCLEAR MATERIAL ACCOUNTANCY, CONTROL & SAFEGUARDS (ONMACS)

IX. SUBSIDIARY ARRANGEMENTS MADE UNDER THE UK-IAEA VOLUNTARY OFFER AGREEMENT

X. IAEA SAFEGUARDS GLOSSARY

XI. INTERNATIONAL TARGET VALUES, STR-368 2010

XII. ONR GUIDANCE SECURITY ASSESSMENT PRINCIPLES (SyAPs)

XIII. ONR GUIDANCE TRAINING AND ASSURING PERSONNEL COMPETENCE (NS-TAST-GD-027)

XIV. ONR GUIDANCE MEASUREMENT OF COMPETENCE (CNS-TAST-3.3)

XV. DEPARTMENT OF TRADE AND INDUSTRY - DEFINITION OF ESSENTIAL EQUIPMENT FOR FACILITY OPERATION - AN OPERATOR'S PERSPECTIVE

XVI. INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO) STANDARDS - ISO17025 and ISO10012 – Specific to internationally recognised measurement control arrangements.

XVII. INTERNATIONAL ORGANISATION OF LEGAL METROLOGY (OIML) RECOMMENDATIONS

XVIII. Guide to the expression of uncertainty in measurement (GUM), https://www.bipm.org/utils/common/documents/jcgm/JCGM_100_2008_E.pdf

7. GLOSSARY AND ABBREVIATIONS

ACP	Accountancy and Control Plan
BEIS	Department for Business, Energy and Industrial Strategy
BoD	Board of Directors
BTC	Basic Technical Characteristics
C&M	Care and Maintenance
DAP	Duly Authorised Person
EEL	Essential Equipment List
EIMT	Examination, Inspection, Maintenance and Testing
EMM	Enforcement Management Model
FA	Facility Attachment
FSE	Fundamental Safeguards Expectation
FSyP	Fundamental Security Principle
HOW2	ONR Management System
IAEA	International Atomic Energy Agency
ICR	Inventory Change Report
ID	Inventory Difference
IDAL	Inventory Difference Action Level
IR	Intervention Record
ITVs	International target Values
KMP	Key Measurement Point
LC	Licence Condition
LFE	Learning From Experience
LII	List of Inventory Items
LMfS	Leadership and Management for Safety
MACE	Material Accountancy and Control Expectation
MBA	Material Balance Area
MBR	Material Balance Report
MUF	Material Unaccounted For
NCA	Nuclear Co-operation Agreement
NDA	Non-Destructive Assay
NISR 2003	Nuclear Industries Security Regulations 2003
NMA	Nuclear Material Accountant
NMAC	Nuclear Material Accountancy and Control
NMACS	Nuclear Material Accountancy, Control and Safeguards
NMAS	Nuclear Material Accountancy System
NSR19	The Nuclear Safeguards (EU Exit) Regulations 2019
ONMACS	ONR Guidance for Nuclear Material Accountancy, Control and

	Safeguards
ONR	Office for Nuclear Regulation
OIML	International Organisation of Legal Metrology
PIL	Physical Inventory Listing
PIT	Physical Inventory Taking
PITe	Physical Inventory Taking Evaluation
PIV	Physical Inventory Verification
PSP	Particular Safeguard Provisions
QNF	Qualifying Nuclear Facility
QNM	Qualifying Nuclear Material
RID	ONR Regulatory Issues Database
RPG	Relevant Good Practice
SBI	System Based Inspection
SBD	Safeguards By Design
SHNM	Small Holders of Nuclear Material
SQEP	Suitably Qualified and Experienced Person
SSBI	Safeguard System Based Inspection
SSC	System, Structure or Component
TAG	Technical Assessment Guide
TEA 2013	The Energy Act 2013
TIG	Technical Inspection Guidance
VOA	Voluntary Offer Agreement

APPENDIX 1 – STANDARD DEFINITIONS

The following definitions are provided from the IAEA Safeguards Glossary 2001 Edition (Ref. X).

International Standards of Accountancy

Values of the measurement uncertainty σ_E expected for closing a material balance. These values, which are based on operating experience at the various types of bulk handing facility, are considered achievable under the condition of normal operation. For calculating the international standard for the uncertainty of a material balance, the standard from (**Error! Reference source not found.**) (expressed as a relative standard deviation) is multiplied by the throughput.

The σ_E values can be used as guidance as to what can be typically expected for the measurement uncertainty of a specific facility type. However, good practice is to use the International Target Values (see below) (Ref. XI) to determine whether a facility's actual measurement system meets international standards, and that any associated facility inventory difference can be explained by its measurement performance.

Table 1. Expected measurement uncertainty σ_E associated with closing a material balance

Bulk handling facility type	*σ_E*	*% Uncertainty*
Uranium enrichment	0.002	0.2
Uranium fabrication	0.003	0.3
Plutonium fabrication	0.005	0.5
Uranium reprocessing	0.008	0.8
Plutonium reprocessing	0.010	1
Separate scrap storage	0.040	4
Separate waste storage	0.250	25

International Target Values (ITVs)

Target values for random and systematic measurement uncertainty components for destructive analysis (DA) and non-destructive assay (NDA) measurements performed on nuclear material. The values are expressed as per cent relative standard deviations, and are values for uncertainties associated with a single determination result; for example, this may be the result reported by one laboratory on one sample (independent of the analytical scheme applied internally in the laboratory), or the result of an NDA measurement performed on a single item. The values are based on actual practical measurement experiences and are intended to be used as a reference for routinely achievable measurement quality by facility operators, SSACs and the IAEA. The values are periodically updated to reflect currently achievable measurement capabilities and to incorporate newly developed measurement techniques and instruments. The currently used set of values (ITV 2010) was published as STR-368(Ref. XI).

APPENDIX 2: OPERATOR PHYSICAL INVENTORY TAKE (PIT): PITe, PIV AND/OR ACCOUNTANCY CHECK

1. PURPOSE AND SCOPE

1.1 This appendix sets out additional guidance on the scope and purpose of ONR inspections associated with an operator's Physical Inventory Take (PIT).

1.2 The purpose of a PIT is for the operator to establish the physical inventory within an MBA at a given date and involves the operator identifying, counting, measuring or deriving estimates of all qualifying nuclear material (QNM).

1.3 This guidance will be used by ONR to judge the operator's compliance with the requirements of NSR19, particularly the adequacy and implementation of the arrangements made by the operator in order to gain assurance of the accuracy of the operator's physical inventory.

1.4 When applying this guidance Inspectors should be proportionate. The attention applied to a facility should reflect the consequences of safeguards non-compliance (hazard and risk in safeguards terms) posed by the facility, along with other factors such as the operators regulatory performance. The factors that inform ONR's judgement of the level of safeguard related regulatory attention are set out in the regulatory strategy for the Safeguards sub-Division.

1.5 The guidance provided is split into three main elements:

a) Section 3 - Purpose of a PIT and related inspections within NSR19

b) Section 4 – Guidance on arrangements

c) Section 5 - Guidance on inspection of arrangements and their implementation.

2. THE NUCLEAR SAFEGUARDS (EU EXIT) REGULATIONS 2019

2.1 The NSR19 sets out several specific requirements in respect of the PIT and associated reporting activities including:

a) Basic Technical Characteristics (BTC)
   i. Regulation 3 requires the declaration of a BTC that includes arrangements and procedures associated with physical inventory taking.

b) Programme of Activities
   i. Regulation 4 requires operators submit a programme of activities for the following calendar year indicating provisional dates for the PIT and then to inform ONR at least 40 days before the day on which the physical inventory is to be taken.

c) Particular Safeguards Provisions (PSP)
   i. Regulation 5(4) (d) enables ONR to impose particular safeguards provisions on an operator relating to the frequency of, and procedures for, taking a physical inventory.

d) Accountancy and Control System
   i. Under Schedule 2 required by Regulation 6, an operator must carry out a PIT, have procedures in place that describe the PIT (including any measurement uncertainties), generate a list of inventory items (LII) and, on request, supply the LII to ONR to assist in ONRs verification activities.

e) Operating records
   i. Regulation 10 requires the operating records set out the sequence of actions to prepare for, and take a physical inventory to ensure that the inventory is correct and complete.

f) Material balance report and physical inventory listing
   i. Regulation 15 (3) sets out the frequency of a PIT. The PIT should be taken every calendar year with the period between two successive PITs not exceeding 14 months.

   ii. Operators must submit a physical inventory listing (PIL) and an associated material balance report (MBR) to ONR within 15 days of the PIT as required by Regulation 15 (1) and 15 (2).

g) Qualifying nuclear facility with limited operation
   i. Regulation 31 requires those facilities which have been granted the status of a qualifying nuclear facility with limited operation (Small Holder of Nuclear Material, SHNM), to carry out an annual PIT and inform ONR of the results of the PIT within 30 days in a form specified by ONR.

3. PURPOSE OF A PIT AND RELATED INSPECTIONS WITHIN THE REGULATIONS

3.1. The purpose of a PIT is for the operator to establish the physical inventory within an MBA at a given date and involves the operator identifying, counting, measuring or deriving estimates of all qualifying nuclear material. The physical inventory is declared by the operator in a PIL.

3.2. The physical inventory should then be compared by the operator to the book balance which is determined by summing all inventory changes in the MBA during the material balance period and declared on the MBR. The MBR will record the inventory difference (ID) between the physical inventory and book balance. The ID should be assessed as described under the Material Balance Evaluation section below.

3.3. The PIL and its associated MBR are required to be submitted to ONR within 15 days of completion of the PIT.

3.4. Inspections related to the PIT contribute to ONR assurance that the NMACS system, required under Regulation 6(1), is maintained such that the operator can demonstrate the system and its implementation meets relevant good practice and the requirements specified in Regulation 10(1)(e) and, where relevant, Schedule 2 of the NSR19.

4. GUIDANCE ON PIT PREPARATION AND ARRANGEMENTS

4.1. ONR's regulatory expectations related to the operator's arrangements for taking a physical inventory and their implementation are set out in the ONR Guidance for Nuclear Material Accountancy, Control and Safeguards (ONMACS) Nuclear Material and Accountancy Expectation (MACE) 9.2, and include:

a) that they are readily available, up to date and approved by an appropriate manager or responsible person

b) identified job roles and competent persons to perform the activities with clear definitions of responsibilities

c) halting the movement of qualified nuclear material for the duration of the PIT

d) minimising the amount of qualifying nuclear material held in a process area

e) ensuring qualifying nuclear material is uniquely identified

f) ensuring that there are suitable measurement techniques and technical justifications for estimates of the quantities involved.

4.2. In order to demonstrate compliance with NSR19 and meet the regulatory expectations set out in the ONMACS, the operator should have in place the following arrangements or procedures (where relevant):

a) arrangements for notifications and submission to ONR of:

i. the programme of activities for the next calendar year by 30th September of the preceding year including estimated PIT date and its likely duration

ii. notification of the confirmed PIT date at least 40 days before the date on which the physical inventory is to be taken

iii. for those granted the status of qualifying nuclear facility with limited operations or SHNM under Regulation 31 confirmation the PIT has been performed within 30 days of completion of the PIT

iv. the PIL and MBR within 15 days of the PIT.

b) arrangements and procedures describing the actions to prepare for, and undertake, a PIT and ensure that the inventory is correct and complete including (where applicable):

i. inventory locations, including a flow sheet identifying points where material can be identified, measured or estimated

ii. procedures and methods for operators physical inventory taking including the method of identifying individual items

iii. descriptions of the physical inventory including any hold ups, buffer levels, delay volumes and or unverifiable material or items

iv. any inaccessible areas or safety case constraints.

c) a measurement quality control programme for material accountancy purposes including:

i. description of methods for determining quantities and for estimating measurement uncertainties

ii. description of the methods for establishing measurements at the flow or inventory measurement points, identifying any equations or tables used and calculations to determine quantities

iii. identification of areas or systems where there is material hold up and the how that hold up is measured or estimated

iv. calibration of measurement and test equipment

v. demonstrable compliance with relevant good practice such that the measurement results meet international standards, in particular the IAEA International Target Values (ITVs) 2010 document (Ref. XI). If the operator cannot meet the relevant international standards justification should be provided.

d) The generation of a LII. Although the format of the LII is not prescribed relevant good practice is that an LII (An example of information typically found in an LII is provided in Table 2):

i. utilises ‘stratification’ i.e. have qualifying nuclear material with similar physical and chemical characteristics and within the same measurement uncertainties (i.e. measured or estimated) or location grouped together

ii. be complete and define identities and locations of all items in an MBA or a specified location within a MBA

iii. clearly state any qualifying nuclear material within the MBA that the operator has been unable to physically measure or estimate with the reason clearly recorded.

e) Performance of a Material Balance Evaluation (MBE) to determine if any non-zero inventory difference declared on the MBR is consistent with measurement uncertainty or may reflect other causes. In a process facility this should include:

i. producing a technically justified Inventory Difference Action Level (IDAL) following completion of the PIT

ii. comparing the calculated inventory difference declared on the MBR to the IDAL.

5. GUIDANCE ON INSPECTION OF ARRANGEMENTS AND THEIR IMPLEMENTATION

5.1. The following is neither an exclusive nor exhaustive description of activities that may be undertaken by ONR safeguards inspectors. The attention applied to a facility should reflect the consequences of safeguards non-compliance (hazard and risk in safeguards terms) posed by the facility, along with other factors such as the operators regulatory performance. The factors that inform ONR's judgement of the level of safeguard related regulatory attention are set out in the regulatory strategy for the Safeguards sub-division.

Determine inspection type and preparations

5.2. Once informed of the operator's intention to perform a PIT the inspector may choose one, or a combination of the following activities:

a) A Physical Inventory Take evaluation (PITe) which will take place at the same time as the operator's PIT to enable the inspector to examine and assess the operators PIT process and arrangements
b) A Physical Inventory Verification (PIV) which involves the inspector sampling components of the inventory to be checked to establish the accuracy and completeness of the PIT
c) An accountancy check as a desk-based exercise which may not involve any plant based activity. As a minimum this should involve assessment of the ID and the IDAL and a comparison of the LII to the PIL, which would take place following formal submission of the PIL and MBR.

5.3. In addition to the factors detailed in 5.1 the inspector should judge which inspection type is relevant and the scope of that inspection based on a number of additional factors, including:

a) regulatory intelligence including any existent or emerging issues in the accounting reports

b) hazard and external factors including dose rate

c) resource availability/operational schedule.

5.4. The inspector should notify the operator at least four weeks before the day on which the physical inventory is to be taken of the inspection type to be performed along with an inspection scope document detailing any requests for information or activities that need to be arranged.

Physical Inventory Take evaluation (PITe)

5.5. As the PITe will take place at the same time as the PIT, the inspector will examine the PIT process as it is undertaken. Inspection should include visual observation, discussion with managerial and operational staff in the facilities carrying out the PIT and examination of records. The inspector should make all reasonable efforts to ensure the inspection has minimal impact on the work of the operator during the PIT or any other operational activity.

5.6. A PITe inspects the suitability of arrangements made and the adequacy of their implementation for any or all of the following activities:

a) establish that the operator has the plant in an appropriate state to ensure the best possible results are obtained and they are ready for the PIT including minimising the qualifying nuclear material in process areas

b) confirm the PIT procedures are available, used by those performing the PIT, consistent, approved and owned by an appropriate or responsible person

c) select and review a sample of PIT arrangements and procedures to ensure they describe the responsibility of those involved, the methods they should use and the records that should be kept

d) select a representative sample of the PIT arrangements and check that the procedures are implemented correctly, including methods and quality assurance requirements such as:

i. in facilities where the operator takes measurements to determine the nuclear material inventory:

- examine the relevant procedures in order to determine the suitability of the measurement
- check that up –to-date calibration records are available for all measurement instruments
- observe the taking of the measurement and any calculations to deliver the reported values.

e) Confirm the personnel involved in the PIT are suitably qualified and experienced persons (SQEP)

f) confirm all data processing methods are up-to-date, used as instructed by the arrangements, appropriately understood by the user and produce validated outcomes

g) examine the arrangements and procedures for all measurement activities conducted for accountancy purposes and check for compliance with the declared methodologies including:

i. measurement results should be validated, traceable and approved by a responsible person

ii. where the accountancy data is based on calculations from models, both this data and the models should be validated, traceable and approved by a responsible person

iii. relevant good practice is for the measurement results to meet international standards, in particular the IAEA ITVs 2010 document (Ref. XI). If the operator cannot meet the relevant international standards justification should be provided.

iv. The inspector may carry out a BTC inspection at the same time as a PITe if previously identified in the inspection scope document.

Physical Inventory Verification (PIV)

5.7. As indicated earlier, the inspector may judge that it is appropriate to inspect the compliance of an operator's PIT process and outcome by means of a PIV.

5.8. The PIV would take place at the closing of a material balance period and as soon as possible after the completion of the PIT by the operator to minimise the impact on operational activity and whilst the information on the LII is still valid.

5.9. The PIV enables ONR to make an assessment of the physical inventory as taken by the operator and as recorded in the LII and may include any or all of the following activities:

a) ensure the LII is available no later than the opening meeting of the inspection

b) establish how up to date the LII is at the start of the Inspection period, its usefulness and how correct and complete it is, e.g. if any changes in inventory took place after the PIT the LII is acceptable and adequate if:

i. Increases in the inventory of the qualifying nuclear material are:
- clearly distinguishable from the inventory at the PIT date
- kept physically separate from PIT material
- declared if they result from nuclear production.

ii. Decreases in the inventory of the qualifying nuclear material are:
- known to ONR as a result of an inspection or assessment of that qualifying nuclear material as it was removed
- confirmed as received by a receipt from the receiver of the qualifying nuclear material
- declared if they result from measured discards or nuclear losses.

c) The inspector should use their judgement to identify from the LII a sample of components to be checked, for example by physically identifying, counting, asking the operator to check weigh or other means. The rationale for selecting the sample components should be recorded along with any results that deviate from expectations

d) request justification should the operator have any qualifying nuclear material indicated on the LII which has either been removed from the inventory after the PIT without adequate assessment, or which cannot be inspected or verified during the PIV due to its specific properties or location.

Operator PIT Completion and Declaration / Submission Activities

5.10. On completion of the PIT and generation of the LII, a PIL report will be prepared by the operator detailing all batches of qualifying nuclear material in the MBA. The PIL should be prepared in the format specified in Part 4 of Schedule 1 of NSR19, showing all batches separately, and submitted to ONR within 15 days of the PIT as required by NSR19.

5.11. The physical inventory determined at the PIT and declared in the PIL is compared by the operator to the book balance which is determined by summing all inventory changes in the MBA during the material balance period and declared on the MBR. The ID is recorded on the MBR and is calculated as the "ending physical inventory" (PE) minus the "ending book inventory" (BA). The MBR must be submitted to ONR alongside the associated PIL.

5.12. Any inventory difference between the physical inventory and book balance recorded in the MBR should be assessed by the Inspector and the ONR Nuclear Material Accountant as described under the Material Balance Evaluation section below.

Material Balance Evaluation

5.13. Assessment by ONR of the PIL and related declarations would normally be an office based activity when all the relevant records and reports have been received.

5.14. During the assessment the Inspector and ONR Nuclear Material Accountant should:

a) compare the LII from the PIT to the submitted PIL for completeness and correctness

b) confirm the MBR records the ID and assess the declared value against the IDAL.

5.15. Relevant good practice is for the operator to calculate a technically underpinned IDAL that is specific to the facility and the material balance period being assessed (i.e. the plant, its material flows and the measurement uncertainties). The International Standards of Accountancy included in the IAEA Safeguards Glossary provide generic guidance detailing the expected measurement uncertainty associated with closing a material balance achievable (based on operating experience) for specific facility types under normal operations (shown in Appendix 1 Table 1).

5.16. Analysis by Inspectors and Nuclear Material Accountants of ID and IDAL should identify areas of statistical significance (> 3 standard deviations) and whether or not the facility measurement system is adequate. Where there are areas of statistical significance the Inspector should seek justification and clarification from the operator.

5.17. Further guidance on the regulatory expectations for material balance evaluation has been set out in the ONMACS Nuclear Material Accountancy and Control Expectation (MACE) 9.3.

TABLE 2: INFORMATION TYPICALLY FOUND IN A LIST OF INVENTORY ITEMS (LII)

The following data and elements for an LII may be required as appropriate (* items are essential to enable the inspector to assess and evaluate any measurement results):

Cut-off time and date of PIT*
MBA code*
Locations (KMP / other area identification)*
Stratum identification*
Item identification reference*
Batch identification reference*
Element code*
Element weight*
Isotope weight for enriched uranium and U-233*
Irradiation status (fresh or irradiated)
Item description (drum, tray, rod, assembly etc.)
Material description (MOX, sintered UO2, alloy etc.)
Material Description Code (MDC)
Gross weight
Tare weight
Net weight (of chemical compound)
Element concentration factor (with indication of whether it is nominal, measured or derived)
Isotope enrichment factor (with indication of whether it is nominal, measured or derived)
Poison material (weight %)
Volume
Density
Cooling time of irradiated fuel
Burn up of irradiated fuel
Remarks (if applicable)

APPENDIX 3: SAFEGUARDS SYSTEMS BASED INSPECTION (SSBI)

1 PURPOSE AND SCOPE

1.1 The purpose of this appendix is to provide guidance for ONR inspectors when planning and carrying out inspection activities related to an operator's NMAC Systems. It has been produced as an aide for use during inspection activities carried out by inspectors at Qualifying Nuclear Facilities (QNF) subject to NSR19 to judge the operator's compliance with NSR19. Within this guide the term "SSBI" is taken to mean a Safeguards Systems Based Inspection, distinct from an ONR Safety Systems Based Inspection.

1.2 This appendix sets out the scope and purpose of activities to be performed by inspectors during SSBIs. The Inspector is expected to exercise discretion, proportionately in applying this guidance in relation to the particular circumstances of the safeguarded facility under inspection.

1.3 The term 'operator' is used throughout this guide as defined in NSR19 as "a person or undertaking setting up, operating, closing down or decommissioning a qualifying nuclear facility for the production, processing, storage, handling, disposal or other use of qualifying nuclear material".

1.4 The SSBIs are inspections of systems that directly support NMACS across a site or within an MBA. The aim of an SSBI is to obtain assurance that the systems in place for NMACS are proportionate to and appropriate for the BTC of the QNF. It is recognised that for an operator of a qualifying nuclear facility with limited operation SHNM this would not be an appropriate inspection type.

1.5 SSBIs seek regulatory assurance that equipment delivers the NMACS function, which is claimed within the operator's arrangements (e.g. Accountancy and Control Plans, ACPs). By their nature, SSBIs are focused on equipment that is important to accountancy & control. As such, not all facilities and sites maybe suitable for SSBIs.

2. RELATIONSHIP TO RELEVANT LEGISLATION

2.1 Schedule 2 of NSR19 sets out the components of an accountancy and control system legally required in order to maintain an effective and robust system of accountancy and control for Qualifying Nuclear Material (QNM) at a QNF.

3. GUIDANCE ON PLANNING AN SSBI

3.1 Generic planning aspects for Systems-Based inspections (SBIs) are set down in guidance document GD-059 (Ref. III). The purpose of this section is to assist inspectors in planning those specific aspects of SSBIs relevant to safeguards alone, that can be examined during inspections to establish whether the NMAC systems are being adequately managed and maintained in order to fulfil the requirements of a system of accountancy and control at the QNF, as described in Schedule 2 of NSR19.

3.2 The frequency and scope of SSBIs should be commensurate with the basic technical characteristics (BTC) of the site and/or facility. For applicable sites, Intervention Plans must adequately cover SSBIs and where appropriate, a multi-year plan (nominally 5 years) covering the full cycle of SSBIs will be developed and implemented at the sub-division tactical level.

3.3 The focus of a SSBI is a System, Structure, or Component (SSC), and therefore where a SSC is used across multiple MBAs the inspection may span multiple MBAs. For example a site may have a single computer system for compiling accountancy reports that covers all of site. This may be inspected in a single SSBI.

3.4 SSBIs should be coordinated, where possible, across several facilities to allow inter-facility comparisons to be made (if that would be beneficial) and in order to be as efficient and effective as possible.

3.5 SSBIs should be coordinated with other necessary planned inspections to achieve maximum efficiency and reduce the regulatory burden on the operator (e.g. a safety systems based inspection on the fuel route at a reactor site provides an opportunity for an SSBI to be carried out in parallel).

3.6 It is likely that other safeguards inspections will also examine aspects of safeguards systems. For example an accountancy focused inspection will test the accountancy procedures that generate the operator records and the output of the accountancy and data processing systems that produce accountancy reports. An inspector might infer the accountancy system's performance from that type of inspection, but they would not gain direct assurance of the system's suitability and reliability to the same level as in an SSBI. SSBIs are distinct in that they will examine the systems in question in a holistic way in order to obtain more complete assurance of the system.

3.7 Typically, SSBIs on a complex nuclear chemical plant may require multiple days on site to carry out a comprehensive inspection potentially employing inspectors from across ONR's specialisms. For simpler SSBIs it may be sufficient to plan for a day on site undertaking inspections and may only require two inspectors.

3.8 The site lead safeguards inspector will normally (but doesn't have to be) part of the team. So, for example, for SSBI on the SSCs for measurement and characterisation of SNM in a Reprocessing Facility the team may comprise of the site inspector, plus two Safeguards specialists with this skillset and Nuclear Material Accountants. Specialist support may also come from colleagues from other ONR specialisms.

3.9 Inspectors should consult the operator's ACP, BTC and relevant safeguards information once they have selected the sample of SSCs for inspection; in order to understand the expected arrangements to be implemented around those SSCs.

3.10 Inspectors should refer to the current list of NMAC SSCs when planning an SSBI in order to aid in comprehensively targeting an appropriate sample for inspection. This list of SSCs should contain indication as to which of the five key fundamental expectations each SSC may be inspected against.

3.11 The five key ONMACS expectations that are inspected as part of SSBIs are outlined below:

a) FSE 3 – Competence Management
b) FSE 5 – Reliability, Resilience & Sustainability
c) FSE 6 – Measurement Programme and Control
d) FSE 7 – Nuclear Material Tracking
e) FSE 8 – Data Processing and Control

3.12 Advice on inspecting against these expectations is provided in Section 5 of this Appendix.

3.13 An operator's safeguards systems can be categorised and linked to specific areas of the ONMACS (2) as follows:

I. Identification Equipment – Systems which allow for the unique identification of batches of QNM, and the ability to process those identities.

II. Computerised tracking (without data processing) – Computer systems which track material inventories but do not compile accountancy reports, e.g. pond tracking systems.

III. Tracking and data processing systems – Similar to the previous category, with the addition that these systems are responsible for compiling the xml data files that hold the operator's accountancy reports and are sent to ONR. This category also includes any systems that solely compile the reports without any tracking functionality; the crucial aspect is the compilation of the accountancy reports (ICR/MBR/PIL).

IV. Measurement systems – Primary measurement systems which are responsible for providing the flow and inventory data within operator reports, i.e. material assay equipment such as gamma spectrometers and weigh scales.

V. Confirmatory measurement systems – Secondary measurement systems that provide additional confirmation of material quantity. It confirms that material weights matches the primary measurement, e.g. endoscopy or weigh scales for confirmatory checks of nuclear materials accountancy data which have been obtained from a primary measurement system. Confirmatory measurements are considered as supporting the material tracking system by providing an extra check of item characteristics. For confirmatory measurement systems to be useful they need to be within order acceptable/justified tolerances to the result from the primary measurement systems, otherwise the check will provide little value.

3.14 SSCs I to V above are rated under Fundamental, Significant, and Support importance to NMACS, with each defined as follows:

I. **Fundamental** - System, Structure or Component that provides a *Fundamental* Nuclear Material Accountancy and Control & Safeguards function. Without the SSC the validity and accuracy of the reporting data would be challenged, and/or the Operator would be challenged to produce the accountancy reports. These SSCs tend to not be easily substitutable.

Examples include: Accountancy and Control reporting software, and Bespoke/unique accountancy and control equipment.

II. **Significant** - System, Structure or Component that provides an *Important* Nuclear Material Accountancy and Control & Safeguards function. The system is important but the outcome can be achieved by alternative means. This SCC provides more than an assurance role but is not fundamental to NMAC, and can be substituted or is one of a number of items in the MBA providing the same role. These SSCs often minimise human error.

Examples include: Bar code readers, cylinder IDs, measurement equipment, and local accountancy software.

III. **Support** - System, Structure or Component that provides a *Support* function to Nuclear Material Accountancy and Control & Safeguards. An SSC that has a role in NMAC but doesn't perform a vital role, only providing additional assurance to NMAC.

Examples include: Confirmatory weigh scales, Endoscopes

3.15 Inspectors should primarily consider those systems of fundamental and significant importance to NMACS when planning a SSBI, to ensure there is a regulatory focus on those SSC's which are of the most importance to NMACS.

3.16 Inspectors should review and refer to the Safeguards inspection plan for the facility and previous SSBIs when selecting their sample of SSCs, in order to avoid duplication of effort, incorporate past regulatory issues and ensure adequate coverage in the overall sample selected throughout the cycle of inspections.

3.17 The relevant SSBIs from the multi-year plan should be incorporated into the IIS plan for that site/facility along with the other compliance inspections and interventions to prevent overlap and enable deconfliction of regulatory activities.

3.18 The inspector should liaise with the relevant ONR colleagues to establish any current regulatory intelligence that may impact on or focus an SSBI (e.g. nuclear safety or security inspectors regarding operational challenges or arrangements for containment of and access to nuclear material).

4. GUIDANCE ON SSBI IMPLEMENTATION

4.1 This section provides advice to Inspectors concerning the implementation of SSBIs. Generic advice on planning and execution of SBIs can be found in GD-059 (Ref. III).

4.2 It is important that the inspection team has identified beforehand the relevant matters from the ACP that will allow them to determine whether the SSC adequately meets its NMACS functional requirements. The inspectors are required to form an overall judgement as to whether the SSC adequately fulfils its NMACS functional requirement, as claimed in the operator's arrangements.

4.3 When carrying out an SSBI, it is important to note that the inspector is also inspecting the adequacy of the implementation of the arrangements for the ONMACS expectations, in section 3.11 of this appendix, in relation to a particular SSC.

4.4 Operating instructions are implemented to maintain NMAC in a manner appropriate and proportionate to the particular facility and aligned to the safeguards regulatory strategy, and provide information necessary to recover from SSC faults or failures during the operations, as well as any safeguards discrepancies that affect NMACS.

4.5 Inspectors will be reviewing the relevant operating instructions, procedures and records associated with activities carried out on SSCs for systems related to safeguards to ensure that safeguards functions, and actions supporting safeguards functions, are capable of being met. Operating instructions should include redundant and diverse provisions, and back-up or stand-by arrangements for those SSCs rate of high importance to NMAC.

4.6 SSBIs should be coordinated, where possible, across several facilities within the Safeguards sub-division to allow inter-facility comparisons to be made (if that would be beneficial) and in order to be as efficient and effective as possible. In addition, the site visits should be coordinated with other necessary planned visits to achieve maximum efficiency and reduce the regulatory burden on the operator.

4.7 The inspector should apply proportionality in judging whether the SSC adequately fulfils its NMACS functional requirement in relation to a particular FSE, taking into account whether the SSC is of high, medium, or low importance as described in this guidance appendix section 3.14.

4.8 The inspector's judgement on whether the SSCs can fulfil their safeguards function adequately should be incorporated as regulatory intelligence to feed into ACP inspections, where the ACP may reference arrangements regarding that specific SSC.

4.9 Maintaining records in the form of Intervention Records (IRs) and intervention plans in relation to the SSBI is critical such that once the nominal multi-year cycle of SSBIs are

completed the outcomes can be reflected on for future planning and inspectors can review previous findings to inform future SSBI inspections.

4.10 When conducting an SSBI against any of the key 5 expectations identified, the inspector may consider the following for each as well as other relevant expectations within ONMACS, as this list is non-exhaustive.

4.11 When rating an SSBI, ONR Inspectors should follow the guidance provided in "Appendix 9 – inspection ratings guide" of ONR-INSP-GD-064 (Ref. II)

5. FSE-Specific Guidance for SSBI Implementation

5.1 **FSE 3 – Competence Management** - Operators must implement and maintain effective arrangements to manage the competence of those with assigned NMAC roles and responsibilities.

a) ONR Guidance on assessing competence NS-INSP-GD-10 & NS-INSP-GD-12 may provide insight for the inspector with respect to Training and SQEP under FSE 3.

b) Review of Training records that demonstrate claimed competence for SQEP staff to use the SSC. Inspectors should note that operators may have developed their own unique training programme and these unique programmes should be assessed on a case-by-case basis.

c) Review of Sign-off requirements and associated Certification on key SSCs (e.g. DAP sign-off, in date, etc.).

d) Conversations with individuals playing key roles in NMACS including walkthrough of processes involving the use and maintenance of SSCs in order to support a judgment on FSE 3 (e.g. DAPs, Plant Managers, SSC owners, those responsible for maintaining SSCs).

e) Checking job/role holder competence assessment to ensure that the competence and experience the individual has meets the competence and experience requirements identified for that job/role.

f) Check training/assessment records to determine if an assessment of competency has been completed and that it includes the application of the individual's knowledge and experience relating to nuclear safeguards activities that are relevant to the role.

g) Check that the competency of duly authorised and other 'suitably qualified and experienced persons' (SQEPs) to operate the SSC and fulfil their role is reassessed.

h) Through sampling, check that SQEPs/DAPs understand their responsibilities and authority with respect to the SSC and the specific job/role they are undertaking.

5.2 **FSE 5 – Reliability, Resilience & Sustainability** - Operators must design and support their nuclear material accountancy and control regime to ensure it is reliable, resilient and sustained throughout the entire lifecycle of the facility. The ONR inspector should confirm:

a) That the operator is able to demonstrate and manage the competence of staff operating a safeguards system, and that maintenance is carried out in line with claimed safeguards performance. The expectations of ONMACS, FSEs 3 and 5

provide further detail on ONR's expectations in these areas. Where computerised systems are involved, the inspector should be aware of cyber security expectations in FSyP 7 of the SyAPs (Ref. XII).

b) That the requirements for safeguards SSCs are regularly reassessed.

c) That the potential dependencies and/or vulnerabilities of the SSC have been identified and mitigated.

d) Whether LFE regarding use of the SSC is captured and distributed to safeguards personnel.

e) That a process of continuous improvement is in place relative to the SSC's reliability, resilience and sustainability.

f) That evidence of the response to the failure or loss of part, of or all of, a Safeguards SSC is regularly exercised or rehearsed.

5.3 **FSE 6 – Measurement Programme and Control** - Where measurements are performed, operators must implement and maintain robust arrangements to ensure the appropriate performance of measurement systems that provide data for the purposes of nuclear material accountancy and control. The ONR inspector should:

a) Confirm the operator has an established measurement system for determining quantities of nuclear material received, produced, shipped, lost or otherwise removed from the inventory that conforms to the relevant international standards (Regulation 6(6)). The system should include measurement arrangements that are appropriate for any Key Measurement Points (KMPs) in place.

b) Confirm the SSC is capable of recording measurements for the purposes of NMAC in alignment with the claimed tolerance, accuracy, precision, etc.

c) Confirm that measurement SSCs utilised for NMAC undergo regular calibration prior to usage.

d) Confirm that measurement results generated by the SSC are validated, traceable and approved by a responsible person. The expected implementation of the measurement system is described in detail in FSE 6 of the ONMACS.

e) Confirm that safeguards measurement SSCs receive regular and systematic examination, inspection, maintenance and testing (EIMT).

f) Confirm any outputs and LFE of technical papers associated with NMAC&S SSC's in sampled MBA's (e.g. Inventory Difference Action Level Investigations) are considered or utilised in the maintenance and development of the measurement systems.

g) Where MBAs receive material measured elsewhere, identify the chain of custody to the point where the material was measured in order to inform a measurement SBI at that point and location.

5.4 **FSE 7 – Nuclear Material Tracking** - Operators must implement and maintain a nuclear material accountancy and control system that is able to provide identification, quantity, characteristics and track any nuclear material in their facilities at any time. The inspector should:

a) Confirm the existence of unique identifiers for items of QNM in the form of the marker which makes an item uniquely identifiable e.g. serial numbers and

barcodes. Material Accountancy & Control Expectation (MACE) 7.2 – Identification of Nuclear Material, in the ONMACS provides further detail on ONR expectations regarding unique identifiers.

b) Confirm whether the Identification equipment for Safeguards fulfils its claimed capability and is able to determine the identity of an item e.g. barcode readers and endoscopes. Unique identifiers and identification equipment are considered to support the nuclear material tracking system.

c) Seek evidence to demonstrate that these SSCs (and subsequent arrangements within the ACP) are able to provide the required information on QNM within the facility.

5.5 **FSE 8 – Data Processing and Control** - Operators must implement and maintain data processing systems that are capable of producing the nuclear material accountancy and control declarations required under the NSR19 and that integrate technical and procedural controls to protect the confidentiality, integrity and availability of sensitive nuclear information.

5.6 The expectation is that operators have a system that is capable of producing the accountancy reports required under NSR19 in a timely and compliant manner. The inspector should:

a) Confirm the data processing system is able to produce inventory lists permitting inventory checking by the operator;

b) Confirm Inventory lists provide the information necessary to identify discrepancies between the locations described in the records and the real physical location;

c) Confirm there is regular reconciliation of operating records and accounting records, when the accountancy of nuclear material in process involves separate storage of these records;

d) Confirm that information detailing the results of inventory checking and database reconciliation, including documentation of discrepancies encountered (for the purpose of performance indicators) is maintained.

APPENDIX 4: ACCOUNTANCY AND CONTROL PLAN (ACP) INSPECTION

1 PURPOSE AND SCOPE

1.1 The purpose of this appendix is to provide guidance for Inspectors when planning and carrying out inspection activities related to an operator's Accountancy and Control Plan (ACP).

1.2 ACP inspection involves a set of activities carried out by Inspectors at a QNF to assure them that the arrangements and procedures described in the ACP that form the system of accountancy and control are being implemented effectively at the facility.

1.3 The purpose of an ACP inspection is to ensure that the operator has established a robust accountancy and control system and that its implementation on site complies with the requirements specified in NSR19. However, elements of an operator's ACP may be inspected through the other safeguards inspection approaches depending on the frequency of inspections undertaken at that facility or site.

1.4 This guidance has been prepared as an aid for use during the planning, preparation, and implementation of inspection activities carried out by inspectors at civil nuclear facilities subject to NSR19 and is to be predominantly used in judging the operator's compliance with NSR19. The inspection of ACPs for SHNMs is described in a HOW2 process.

1.5 This appendix sets out the scope and purpose of activities to be performed by Inspectors during ACP inspections. The Inspector is expected to exercise discretion, proportionately in applying this guidance in relation to the particular circumstances of the safeguarded facility under inspection.

1.6 This guidance does not indicate the frequency or scope for inspections of the operator's ACP under NSR19. This is covered in individual inspector's inspection plans, the scope and content of which are determined using the ONR Safeguards Sub-Division Regulatory Strategy and associated governance.

1.7 Note that the requirements of NSR19 relate only to those activities undertaken for civil purposes; activities for defence purposes are excluded from the UK nuclear safeguards regime.

1.8 The Fundamental Safeguards Expectations (FSEs) for NMAC&S are identified as the foundation for the subsequent MACEs in the ONR Guidance for Nuclear Material Accountancy, Control and Safeguards (ONMACS). They are founded in UK law through NSR19, in the requirements of relevant international agreements and in international good practice. The FSEs are split into two distinct classes. These include Strategic Enablers, which are aligned with other ONR regulatory compliance arrangements and material controls, which focus specifically on the implementation and maintenance of NMAC arrangements.

2. RELATIONSHIP TO RELEVANT LEGISLATION

2.1 NSR19 regulation 7 requires operators to produce an ACP for a qualifying nuclear facility[3] including Small Holders of Nuclear Material (SHNM), which must describe in

[3] Qualifying nuclear facility is defined in NSR19 and Section 76A of The Energy Act 2013 as "a facility (including associated buildings) in which qualifying nuclear material is produced, processed, used, handled, stored or disposed of"

writing[4] the arrangements and procedures adopted or to be adopted by an operator to establish and maintain a system of (NMAC) as required by Regulation 6. The components of an accountancy and control system are set out in Schedule 2 of NSR19.

2.2 Regulation 8 relates to the replacement, amendment and revocation of an ACP. Operators must amend the ACP following a change to the Basic Technical Characteristics (BTC) of the QNF, and send the amended ACP to ONR within 30 days beginning on the day on which the change is made (unless otherwise specified in a Particular Safeguards Provision, PSP). ONR's use of PSPs is however expected to be limited. Operators may amend any parts of the ACP for a QNF that have not been approved by ONR; they must not amend any part of the ACP that has been approved by ONR without the prior written consent of the ONR.

2.3 Regulation 9 requires operators to implement and comply with the arrangements and procedures described in the ACP.[5]

2.4 As ACPs as are a new requirement under NSR19, Inspectors should prepare a pre-inspection briefing for the Operator, in order to talk through the provided inspection scope, clarify ONR's regulatory expectations and requirements relating to the sampled arrangements, and outline in more detail some examples of evidence that may be sought in relation to the FSEs described in ONMACS. This guidance should therefore be read and use in conjunction with ONMACS.

3. GUIDANCE ON INSPECTION AGAINST ACCOUNTANCY AND CONTROL PLANS AND THEIR IMPLEMENTATION

3.1 Operators must produce and send to ONR within 30 days of 1 January 2021, an ACP for a qualifying nuclear facility which sets out the accounting and control system for the qualifying nuclear material in that facility. For SHNMs, ONR's approach is to align the submission of ACPs with the intent of the transitional provisions for NSR19. SHNMs will be required to submit an ACP to ONR by 31 January 2022, or earlier if they apply for the reduced reporting regime provided for in Regulation 31 of NSR19.

3.2 The operator must implement and comply with the arrangements and procedures described in the ACP. The implementation of the arrangements should be examined periodically by the safeguards inspector. ONR uses a sampling approach in deploying its resources. As such, it may not be necessary to assess the implementation of every aspect of an ACP in full. The breadth and depth of the inspection is established by the inspector as part of the inspection plan.

3.3 The operator should also have in place a programme of training for operational personnel who are involved in the management and control of nuclear material. Adequate records of training shall be maintained.

[4] Writing includes the use of electronic media

[5] Concerning a matter arising which could be regarded as an operator having failed to comply with these arrangements and procedures, this will not be the case if the ONR has previously informed the operator in writing that in the ONR's opinion, it is unlikely to be prejudicial to the maintenance of the system of accountancy and control in respect of the QNM at the QNF.

3.4 The inspector should confirm that all sampled arrangements and procedures are being implemented as claimed in the ACP. Though the following is not exhaustive, this may be done by:

a) Discussions with key staff identified in those arrangements and procedures in order to determine their understanding of process flow, the purpose and use of key equipment, and response to NMACS discrepancies.

b) Observation of physical identifications of QNM items / batches, through direct observation or operator photographic/video footage where appropriate, taking into account safety rules.

c) Observation of key accounting records to be produced from the movement of QNM between and within MBAs, followed by the checking of these records against the physical reality.

d) Confirming the existence of a non-conformance resolution procedure, as well as its implementation through viewing of records detailing the actions to resolve past discrepancies.

4. GUIDANCE ON ACP INSPECTION AGAINST ONMACS FSEs I-10

FSE 1 – Leadership and Management for Nuclear Material Accountancy, Control & Safeguards

4.1 The periodicity of Leadership and Management for NMACS interventions will be influenced by the annual ONR assessment of the operator's safeguards performance, together with any findings and regulatory intelligence obtained during previous inspections. Once these initial considerations have been reviewed, the inspector should be in a position to define and agree the outcomes and outputs of the intervention. Where delivery of these objectives identifies the requirement for additional regulatory resources, support from other specialists, for example ONR Leadership and Management for Safety (LMfS) inspectors, should be sought.

4.2 During an ACP inspection targeting arrangements for Leadership and Management for NMACS, Inspectors may wish to consider whether:

a) The Operator's Board of Directors (BoD) ensures that NMACS is given due priority to safety and security when providing strategic direction and leadership. This might be evidenced through policy and receipt of an Annual NMACS Performance report.

b) described mechanisms to ensure the BoD receive current, high quality NMACS information on risks are being implemented e.g. Risk Committee or Annual NMACS Performance report.

c) the Board has implemented the appropriate membership and competence to assess and act effectively on NMACS information where claimed.

d) NMACS, standards and expectations are effectively communicated across the organisation to those with roles of NMACS responsibility or consequence.

e) NMACS activities are included in operational schedules e.g. PIT/PIV.

f) relevant staff are routinely consulted and engaged on NMACS issues such that their skills and knowledge are used to inform decision making at senior levels.

g) NMACS arrangements are included in an Integrated Management System that adheres to RGP.

h) the BoD is an 'intelligent customer' with sufficient NMACS competence or experience to ensure assurance reports inform effective decision making.

i) the operator design authority's formal processes understand and maintain NMACS design knowledge, and assess the impact of proposed design changes on the functionality, reliability and availability of NMACS arrangements contained in the ACP.

j) Stakeholders (both internal and external) are involved in the decision-making process.

k) NMACS is given due consideration alongside Safety, Security and Environmental factors to ensure that NMACS is not eroded or de-prioritised, and there is a process for the organisation to make decisions where there may be a conflict between Safety, Security, Environment and NMACS.

l) There is an independent internal assurance function with clearly defined terms of reference (including responsibility, accountability and authority), and the Board demonstrates it uses this function and that it values its outputs.

m) the outputs from assurance activities feed a well-defined Governance structure. There should be an Executive meeting to consider NMACS performance for the organisation and determine improvement priorities and re-prioritisation.

FSE 2 – Organisational Culture

4.3 During an ACP inspection targeting NMACS organisational culture, Inspectors may wish to consider whether:

a) the organisation has a clear and accessible NMACS policy statement that is contained within the overall management system and is reviewed and updated periodically.

b) leaders and managers check to ensure that the NMACS culture of supply chain partners meets their standards and expectations.

c) the operator has a clear mechanism to ensure contractors display 'site-wide' behaviours and culture, and tenant organisations and contractors have access to 'site-wide' NMACS training and NMACS culture initiatives.

d) during investigation of events, the arrangements ensure NMACS culture is considered as a contributing feature, and is the potential impact of subsequent improvement programmes on NMACS culture considered.

e) leaders and managers display behaviours which demonstrate their commitment to the NMACS policy statement, and support and accept challenge.

f) members of staff with roles and responsibilities that could impact NMACS recognise the NMACS policy statement and can they explain their role in its implementation.

g) annual reviews of staff performance include an element looking at NMACS performance and culture.

FSE 3 – Competence Management

4.4 ONR provides general guidance on the inspection of competence management on safety and security in the documents NS-TAST-GD-027 (Ref. XIII) & CNS-TAST-GD-3.3 (Ref. XIV).

4.5 Methods and example activities that inspectors may wish to employ in confirming the implementation and maintenance of arrangements to manage the competence of those with assigned NMAC roles and responsibilities include:

a) confirming evidence of the training records of staff, as well as established arrangements for all staff such as training plans and programmes.

b) discussions and walkthroughs of process with facility operations staff to determine familiarity with key processes including non-conformance resolution, escalation and the reporting of anomalies.

4.6 Specific activities that may contribute to the confirmation of competence management and SQEP staff are included throughout this document under the individual material control FSEs 6-10.

FSE 4 – Reporting, Anomalies and Investigations

4.7 Methods and example activities that inspectors may wish to employ in confirming the implementation and maintenance of arrangements for the timely and accurate reporting of information required by NSR19 include:

a) confirming the existence of a procedure to recognise, investigate and document the treatment of non-conformances (or other unusual occurrences) in a timely manner, as well as the application of this procedure through examining records.

b) confirming the responsibilities defined for the internal communication required when actions under NSR19 Regulations 16 & 17 are required, as well as the implementation of the mechanisms under which such personnel will inform the ONR.

c) confirming the responsibilities and authority defined in order to provide further detail or explanation when requested under NSR19 Regulations 3(5), 12(3) and 16(2).

FSE 5 – Reliability, Resilience and Sustainability

4.8 During an ACP inspection targeting Reliability, Resilience and Sustainability, Inspectors to consider whether:

a) reliability, resilience and sustainability has been implemented throughout the design stage for any new facility or NMACS system, within the relevant operational requirements documentation.

b) there is evidence that the requirements for NMACS systems are regularly reassessed.

c) the competencies required to sustain a nuclear NMACS workforce are maintained through recruitment, retention and training.

d) essential services (such as power) necessary for the correct functioning of the NMACS system have the levels of NMACS, reliability and resilience claimed.

e) NMACS systems ‘fail secure’ as described and if they do not, NMACS requirements are appropriately balanced against safety requirements with compensatory NMACS measures implemented.

f) operators’ experience of NMACS system failure and breakdown is in line with reliability claims, trends and recovery and substitution arrangements.

g) a process for capturing project assumptions related to EIMT generated by the on-going design and NMACS analyses, along with an auditable record of where these assumptions are recorded in operational documents is being implemented.

h) the results of human factors assessments of EIMT tasks during testing and commissioning have been implemented; inspectors may wish to look in particular for error traps and common cause failure mechanisms created by the procedures or by operator actions.

i) EIMT is carried out within the specified intervals, and by SQEPs using the claimed tools and procedures and calibrated as specified in the relevant EIMT and/or calibration procedure.

FSE 6 Measurement Programme and Control

4.9 Methods and example activities that inspectors may wish to employ in confirming the implementation and maintenance of a programme of measurement and control activities are listed in this section.

4.10 When an accreditation against standard ISO/IEC 17025:2005 (Ref. XVI) covers the complete measurement system, inspectors may wish to confirm that the measurement methods under the accreditation are the ones used for accountancy declarations. Where the measurement system is not accredited, inspectors may wish to confirm the existence of arrangements for making and managing measurements under ISO/IEC 10012:2003 (Ref. XVI) which ensure they are sufficiently accurate and precise; inspectors may wish to consult with ONR specialist staff regarding this activity.

4.11 Inspectors may wish to consider that there is a designated person to approve measurement results, check that they are competent, and check that they are approving results and associated uncertainties.

4.12 Inspectors to consider the existence of measurement procedures and evidence of the ongoing verification of equipment.

4.13 Sampling should be representative of the material; inspectors should check for the existence of a sampling plan for and procedures, and check its application. Sampling plans and sampling procedures should be based on statistical considerations, and sampling, as well as the technique should be recorded.

4.14 Inspectors to consider that the implementation of a records management system (e.g. traceability from the source data through to accountancy data) enables the maintenance of a comprehensive record of measurement data.

4.15 Where data provided for the purposes of NMACS is based on calculations that are not direct measurements, inspectors may wish to confirm the calculation method applied is documented, technically justified and validated with real data where possible.

4.16 Inspector to consider if measurement methods used are covered by either international standards, International Target Value (ITVs) (Ref. XI) or other normative documents

(EN standards, ISO standards (Ref. XVI), International Organisation of Legal Metrology (OIML) (Ref. XVII) recommendations or European Safeguards Research and Development Association (ESARDA) published measurement methods). Where the measurement method is covered then no validation of the approach is necessary from the operator. Where the measurement method is not covered and it is used for nuclear material accountancy and control purposes, then the inspector may seek to understand how that measurement method was validated for use.

4.17 Regarding traceability of measurement results, inspectors should check calibration procedures, records, calculations, logbook entries, non-conformities and the associated processes/arrangements for their follow-up.

4.18 Inspectors to consider whether or not the calibration range of an instrument is coherent with the typical measurement range of the instrument. The calibration range should cover all measurements and usual measurement quantities should be at or near the middle of the calibration range.

4.19 The inspector to consider if reference materials (e.g. calibration weights, spikes used for analytical calibration etc.) are appropriately stored and have valid certification (e.g. calibrated value, uncertainty, confidence interval etc.).

4.20 Accuracy should be determined by the calculation and generation of measurement uncertainty figures for every measurement result. Inspectors should check if this has been performed in accordance with the GUM Guide (Ref. XVIII) (Limits should be pre-stated, and it should be assessed not only during validation, but on a regular basis for every measurement.

FSE 7 – Nuclear Material Tracking

4.21 Inspectors to consider sampling different items or batches of material to check if the NMAC system is able to provide complete information about the material concerned. Inspectors should also check records of changes of location, identification, nature or quantities in nuclear materials.

4.22 Inspectors should confirm that there is a documented process to control that transfers of nuclear material into the installation are correctly recorded, and may wish to check/sample those records.

4.23 Inspectors should confirm whether, if the required accountancy data relies on results from sampling and analysis, the data has been entered and identified as provisional and/or estimated pending the return of those analysis results.

4.24 Inspectors to consider that records of items sealed by the operator are retained by the operator.

4.25 Inspectors to consider that the inventory control by the operator includes physical checks of the inventory. They should also confirm whether the method of performing these checks has been documented, and that they have been implemented.

4.26 Inspectors to consider that any NMA data authentication includes a full audit trail to original source documents, and that any amendments to source data for nuclear material movements have only been amended with endorsement by the Nuclear Material Custodian or delegated nominee.

4.27 Inspectors may wish to confirm that the documented procedures for identification of nuclear material are being implemented as declared, and that any item identification changes have been recorded. If there multiple layers of containment, inspectors should

confirm that the required information is available to correctly identify the nuclear material content.

4.28 Inspectors may refer to the facility BTC to confirm whether the different locations in which nuclear material can be held have been identified and are being used as the basis for recording this information. Further ONR guidance on BTC inspection is available in Appendix 5.

4.29 Where appropriate, inspectors should confirm whether there is a way to identify specific positions within areas, and whether this identification is being implemented to locate nuclear material.

4.30 Inspectors to consider sampling specific positions and confirm whether the NMACS system is able to provide complete information on the identification, quantity, and characteristics of the nuclear material present. Inspectors may also wish to confirm that records of any movements have been retained by the operator.

4.31 Inspectors to consider that the NMACS system is able to provide complete information on material that has entered a process or has been subject to repacking.

4.32 Inspectors to consider that the NMACS system is able to trace back the nuclear material from a product to the raw material(s) in the facility.

4.33 Inspectors to consider that procedures for recognising, investigating, and documenting NMACS anomalies are being implemented by the operator.

FSE 8 – Data Processing and Control

4.34 Inspectors should confirm that safe and secure storage measures of all data required for the proper working of the NMACS system are in place. Standard NMACS and safety tools as access records and access rights, as well as automatic back-ups should be included. If these measures are not in place, inspectors should confirm whether a justification by means of risk assessment has been carried out.

4.35 Regarding implementation of the data-processing system, Inspectors should check that the following lists of items are produced by the data-processing system, and not by other means:

a) declarations required under NSR19
b) material balance standard deviation
c) various types of documents linked to ICRs such as shipping documentation
d) working documentation for routine inventory control e.g. LIIs
e) working documentation for PITs
f) LII resulting from PIT and used during PIV or other verification.

4.36 Regarding capabilities of the data-processing system, Inspectors should check that the following list of items is produced by the data-processing system, and not by other means:

a) Provision of inventory lists permitting inventory checking by the operator
b) Inventory lists providing any information necessary for identifying discrepancies between the locations described in the records and the real physical location.

4.37 Inspectors should confirm the capability of the data-processing system to perform match verification between records when there is a double-records keeping system (ISO 17799:2005 [8] requirement (Ref. XVI)).

4.38 Inspectors should confirm the implementation of procedures for and records of non-conformities and corrective actions.

4.39 Inspectors to consider the capability of the data-processing system to receive information on discrepancies from physical verifications, and records matching, and treat that information for the purpose of providing performance indicators.

4.40 Inspectors to consider verifying that the logs and activities with the NMAC Manager regarding the procedures for data-processing execution activities provide them with supervisory information.

4.41 Inspectors to consider whether NMAS documentation:

a) is derived and reconcilable with a single set of source data.
b) is appropriately protective marked in accordance with the classification policy; inspectors may also wish to confirm whether the procedures for protective marking are being implemented as claimed.
c) is readily retrievable for independent audit/verification.
d) has records that are traceable to an authenticated source and kept in a manner that guarantees traceability.

FSE 9 – Material Balance

4.42 Inspectors should refer to NSR19 to confirm whether the nuclear material accounts have been correctly compiled. Further information is available in Appendix 2 on ONR inspections associated with an operator's PIT and in guidance for accountancy inspections.

4.43 Inspectors to consider whether the procedures for receipt and shipment of material and associated activities are being implemented as claimed through review of records.

4.44 Inspectors to consider whether the PIT and Material Balance Evaluation procedures are being implemented as claimed. Further information is available in Appendix 2.

FSE 10 – Quality Assurance for Nuclear Material Accountancy and Control

4.45 Inspectors to consider that the NMACS system performance is being monitored and reviewed through any performance metrics established in associated procedures.

4.46 Evidence on the implementation of quality assurance should also be gained from undertaking the activities described under the other FSEs above.

APPENDIX 5: BASIC TECHNICAL CHARACTERISTICS (BTC) INSPECTION

1 PURPOSE AND SCOPE

1.1 The purpose of this appendix is to provide guidance for Inspectors when planning and carrying out inspection activities related to an operator's Basic Technical Characteristics (BTC). It has been produced as an aid for use during inspection activities carried out at qualifying facilities subject to NSR19. It is to be predominantly used in judging the operator's compliance with NSR19.

1.2 This appendix sets out the scope and purpose of activities to be performed by Inspectors during BTC inspections. The Inspector is expected to exercise discretion, proportionately in applying this guidance in relation to the particular circumstances of the safeguarded facility under inspection.

2. RELATIONSHIP TO RELEVANT LEGISLATION

2.1 The term 'operator' is used throughout this guide as defined in NSR19 as "a person or undertaking setting up, operating, closing down or decommissioning a qualifying nuclear facility for the production, processing, storage, handling, disposal or other use of qualifying nuclear material".

2.2 NSR19 requires the operator to produce a BTC document for each qualifying nuclear facility (QNF) using the relevant questionnaire in Part 1 of Schedule 1 of NSR19. Relevant Regulations within NSR19 include 3 (1-5), 5(1), 5(4).

2.3 Basic Technical Characteristics (BTC) are used to describe safeguards-relevant design information for QNFs.

2.4 Part 1 of Schedule 1 of NSR19 specifies eight types of QNF:

a) Reactors
b) Critical and Zero Energy Installations
c) QNFs where conversion, fabrication and reprocessing are carried
d) QNFs that are used for Storage
e) QNFs where Isotopes are separated
f) QNFs using qualifying material in quantities in excess of 1 effective Kilogram
g) QNFs for the treatment and storage of waste
h) Other QNF or a QNF with limited Operation

2.5 Each type of facility has a BTC questionnaire and these all require information at proportionate levels of detail that:

a) Identify the date of issue / revision

b) Identify the facility - including the operator and location of the facility and types of material the operator manages there and generally the description of the installation, the form, quantity, location and flow of QNM being used, the layout of the installation, containment features.

c) Describes the Accountancy and Control arrangements - in terms of the procedures for QNM Accountancy, Control & Safeguards (NMACS) including procedures for physical inventory taking and organisational arrangements for accountancy and control of QNM.

2.6 Under Regulation 3 (3) an Operator must inform ONR of the changes to a BTC and although there is no requirement to resubmit that BTC it is an ONR expectation that the operator will, in an appropriate and proportionate manner, submit the revised BTC

with that change highlighted, should it be of particular NMACS significance to the facility where the regulatory approach may be affected.

2.7 Regulation 3 (5) allows the ONR to request in writing any further details, explanations, amplifications or clarifications of any information required for regulatory purposes which the operator must then supply.

2.8 In the case of new QNFs under Regulation 3(4) the Operator must declare BTCs at a number of design and construction stages:

a) Preliminary - as soon as the decision to construct or authorise construction has been taken

b) Final design - not later than 200 days prior to and ending on the day on which construction is started, and for as built - not later than 200 days before the day on which

i. QNM is first received at the facility

ii. In the case of a QNF which only treats or stores conditioned or retained waste, the treatment or storage begins; and

iii. In the case of a QNF whose principal activity is the extraction of ores in the United Kingdom, the operations start

2.9 Submissions of the extant and as built declarations should be considered for inspection using the same planning principles as for the BTCs of operating facilities.

3. PURPOSE OF THE NUCLEAR SAFEGUARDS (EU EXIT) REGULATIONS 2019, REGULATION 3

3.1 The information is used by ONR to ensure that not only do the operators comply adequately with NSR19 but also to meet UK obligations for submission to the International Atomic Energy Agency (IAEA) of design information for all eligible facilities under the UK/IAEA Safeguards Agreement.

3.2 The IAEA uses this information to inform decisions on the designation of facilities for inspection and for its development of the IAEA approach for safeguards inspection and verification at facilities which are chosen for designation.

3.3 BTC information is also used by ONR to inform its approach to regulating compliance with NSR19 for the facility, including the assessment and inspection of Accountancy and Control Plans (ACPs) and, where appropriate, the development of Safeguards System Based Inspections (SSBIs).

4. GUIDANCE ON PLANNING THE INSPECTION AGAINST BASIC TECHNICAL CHARACTERISTICS

4.1 The process of planning an inspection is set down in the overarching guidance. The purpose of this section is to assist inspectors in identifying aspects of BTCs that can be examined during inspections to establish whether the declaration is factually accurate and/or that in the inspector's opinion implementation of the operators declared arrangements demonstrates adequate compliance with NSR19.

4.2 When a new BTC has been submitted for a planned facility, or one under construction, inspection activities should be considered, and focussed by assessment, at the earliest relevant time including, for example, to confirm the design and construction of key NMACS related features of the facility which may become inaccessible following construction during the facilities lifecycle. Detailed assessment may be warranted in

the situation of complex facilities whereupon the guidance for assessment of BTCs should also be used in parallel.

4.3 When a revised BTC is submitted which indicates changes to an operating facility already subject to safeguards regulation by the ONR, BTC inspection activities may be carried out before, during, or after the changes, as is appropriate for the particular facility to assure ONR that the changes have been implemented as declared and the outcome does not impact on the existing safeguards approach being adopted by ONR.

4.4 Some of the following may help the inspector when planning for BTC inspection. The following list is neither exclusive nor exhaustive and will be subject to review and revision in the light of operational experience:

a) Establish that the materials present, use of them and purpose of the facility are as set out in the BTC and as reported.

b) Confirm that the geographical location, buildings, envelope and layout, quantities of materials and their containments are as set out in the BTC.

c) Confirm the leadership and management system and that there is a clear understanding of owner / operator accountability.

d) Confirm that an accountancy reporting system is in place and effective.

e) Confirm that arrangements are in place to report and demonstrate control of material and are they being followed.

f) Identify constraints on the NMACS system.

g) Confirm the accountability and significance of NMACS is understood throughout the management chain.

4.5 Aspects of BTCs such as those listed above may also assist and inform the ONR assessment and inspection of ACPs.

4.6 Access to key personnel with the required knowledge of the BTC and its implementation should be identified and planned

4.7 The ONR safeguards inspector should liaise with ONR colleagues to establish any current regulatory intelligence that may impact on or focus an NMACS inspection (e.g. safety or security inspectors regarding operational challenges or arrangements for containment of and access to QNM).

5. GUIDANCE ON INSPECTION AGAINST BASIC TECHNICAL CHARACTERISTICS AND THEIR IMPLEMENTATION

5.1 BTC inspection involves a set of activities carried out by i
5.2 nspectors at a facility to assure themselves of the correctness and completeness of the design information provided by the operator in the BTC.

5.3 The design information is verified to confirm that the as-designed BTC during construction and the as-built design of the facility is as declared and that it operates as declared by the operator. If changes in design information are declared to have taken place, such changes may be confirmed by ONR, including as a possible basis for changing the ONR approach to regulating compliance for the facility against NSR19.

5.4 A BTC inspection contributes to the cumulative knowledge of the facility design; its operation; and the continued validity of ONR's approach to regulating compliance.

5.5 Preliminary BTC information must be provided as soon as the decision is taken to construct a new facility and provides the basis for early consideration of safeguards

requirements for any new project (known as Safeguards by Design (SBD)). Such early consideration and maintaining engagement thereafter has benefits for all stakeholders. Examples of these benefits include minimising the risk associated with project scope, schedule, budget and licensing; and reducing the cost of safeguards implementation to the operator, the national safeguards regulator and the IAEA safeguards inspectorate.

5.6 BTC inspections may be performed throughout the lifetime of a facility. The lifecycle phases of a facility are primarily determined by its operating capabilities. The BTC inspection activities to be carried out are determined not only by the type of facility, but also by the lifecycle phase noting different parts of a facility may be in different lifecycle phases. Section 6 of this guidance describes the lifecycle approach in more detail.

5.7 Due to specific conditions or operational intentions at a facility it may be useful to prepare a BTC inspection strategy as part of underpinning wider inspection planning. Inspectors should consider the operator's plan of key activities to identify where ONR would seek to include as part of its BTC inspection strategy, as well as prepare for reactive inspections corresponding to changes in the operator's planned schedule if proportionate to do so. The scope and objectives of the BTC inspection and any methods and activities to be used should be discussed with the operator in advance of the inspection.

5.8 The intensity of BTC inspection during the lifecycle phases of construction and commissioning will differ from that in other phases. BTC inspection activities should be planned and carried out in a manner designed to avoid hampering or delaying the construction and commissioning of facilities. The operator's construction and commissioning plans should be reviewed with the aim of developing an integrated ONR plan which includes safeguards activities alongside those planned for other ONR purposes.

Key Considerations

5.8 As part of a BTC inspection, inspectors may wish to consider some of the following activities in order to help them judge the operator's compliance against Regulation 3 of NSR19:

a) confirming that the design information submitted to ONR is correct, complete, consistent and timely and the correct BTC questionnaire has been used;

b) confirming the nuclear operations in the facility is as declared. In undertaking this activity, Inspectors might look to physically identify the QNM flow routes and storage locations as declared in the BTC as part of their inspection. Inspectors may make such observations or measurements necessary to verify the accuracy of the BTC and any changes to them declared under regulations 3 or 31.

c) ascertaining the category and quantity of QNM inventory present at the facility in order to help assess the declared capacity / throughput of the facility.

d) checking that the use and installation of operator accountancy equipment /measures is as described in the BTC and that they continue to be fit for purpose. Inspectors may wish to see the installation, maintenance and servicing schedules/requirements of installed accountancy equipment/measures, and procedures that assure the control of QNM during such periods, as well as review calibration records against international good practice;

e) confirming that declared accounting records and relevant operating records are being managed appropriately including being correct, appropriate and up to date, and can be made available to ONR and IAEA inspectors upon request;

f) confirming where appropriate the physical QNM throughput and capacity of the facility and comparing this with the declared throughput and capacity (e.g. inspectors may wish to request the operator to provide the current plant status of the facility);

g) confirming that the operator's QNM flow and inventory verification methods continue to be fit for purpose;

h) confirming that the Operators can demonstrate adequate control of QNM according to the declared arrangements;

5.9 Where inconsistencies with the submitted BTC are identified, inspectors should seek to initially resolve these through discussion with the operator.

Additional Considerations

5.10 The lifecycle phases of a facility are primarily determined by its operating capabilities; different parts of the facility may themselves be in different lifecycle phases. As it is likely that lifecycle changes will be accompanied by a revision to the BTC, ONR's inspection of the BTC should be considered at all lifecycle stages of a facility as defined in ONMACS, and must be targeted and proportionate.

5.11 It is the responsibility of the operator to revise the BTC dependent on any changes to the facility or site, and submit to the ONR. Upon receiving a revised BTC the inspector may carry out an inspection to confirm the submission and will consider alignment with ONR other purposes. This inspection may form part of an assessment (Ref. V) or be standalone reflecting the activities of the site or facility (e.g. Pre-Construction Phase; Commissioning, Decommissioning etc).

5.12 Methods that inspectors may wish to employ in carrying out BTC inspection of some of the example site / facility activities can include:

a) facility walk-through and confirmation of floor plan layouts;

b) physical identification and follow-through of QNM flow routes and inventory locations, including areas where material may be difficult to access and/or measure;

c) examination of records, and any other information related to the facility and associated NMACS;

d) establishing that facility equipment which is essential for safeguards purposes is as described in the BTC (e.g. by the confirming of its presence, checking its functionality, maintenance and operation of facility equipment that is essential for safeguards purposes);

e) engagement with the relevant key operator personnel.

5.13 The Essential Equipment List (EEL) (Ref. XV) is safeguards terminology for those items of equipment, systems and structures necessary for the declared operation of a facility. ONR may choose to devise EELs for certain facilities. Assessment and inspection of the status of equipment on such EELs will inform decisions on whether or not the facility can be considered as decommissioned for safeguards purposes, and be used to support engagement with the IAEA to confirm the removal of facilities from the list of those eligible under the UK/IAEA Safeguards Agreement.

6. BTC - The Lifecycle Approach for Assessment and Inspection

Facility Lifecycle Phases and Objectives

6.1 As highlighted earlier the operator must declare BTCs at a number of design and construction stages and must inform ONR of the changes to a BTC, preferably by re-submission.

6.2 As a facility moves through its lifecycle phases, the uses of the QNM within the facility change, the operations carried out within it change and can lead to changes in the accountancy and control arrangements.

6.3 Thus it should be anticipated that the BTC changes will be declared to ONR throughout design process and the later lifecycle changes. ONR may elect to assess and / or inspect the compliance of the BTC with NSR19 at any stage using a targeted approach aligned with the ONR Safeguards Sub-Division Regulatory Strategy.

6.4 The safeguards lifecycle can be separated into these phases.

I. Pre-construction phase
II. Construction phase
III. Commissioning phase
IV. Maintenance / modification phase
V. Operating phase
VI. Shut-down phase
VII. Closed-down phase
VIII. Decommissioned for safeguards purposes

6.5 The following are guidance on the definition of each phase. The additional objectives of assessment and inspection at each lifecycle phase other than those identified earlier are set out against each of these phases in Table 3. The objectives are not an exhaustive list, and it is for the inspector to judge which of these (and any other objectives) are to be applied to the facility in that stage of its lifecycle. As maintenance and modification are a specific task these are spelt out in more detail below.

Pre-construction phase

6.6 The pre-construction phase for a facility begins as soon as the plan for constructing a nuclear facility or site is decided. This phase includes the planning, design and engineering activities which precede the actual construction of the facility or site.

6.7 An initial approach to regulating compliance against NSR19 can be prepared by assessing the preliminary information. As the design of the facility progresses, there should be further engagement and provision of more detailed information as necessary to allow ONR to refine the approach.

6.8 Assessing BTC information from the outset and discussing the outcomes with the operator assists inspectors to determine whether facility design makes or can be made to give adequate provision for NMACS by the operator (including ONR's ability to inspect the implementation of those arrangements).

6.9 Inspectors may also use BTC submissions on new facilities in this phase to establish and maintain suitable dialogue with the IAEA regarding its appetite for possible designation of the new facility concerned, and therefore the need to prepare for IAEA verification activities and any equipment involved in them.

6.10 The objectives in this phase should be focussed on understanding the purpose of the facility and defining its NMACS in the best way to build in NMACS by design.

Construction phase

6.11 The construction phase of a facility begins with the commencement of foundations and continues until the entire facility is constructed and ready for commissioning. During the construction phase, the design information will evolve as changes to the design occur.

6.12 As construction progresses, or as soon as possible after construction completion, BTC assessment and inspection activities may be carried out to verify specific NMACS related requirements. For instance, the provision of any safeguard holding areas and retrieval machines that may be utilised for physical verification by the Operator. In the event of the IAEA designating a facility, negotiation of the IAEA's verification approach may result in an approach which includes the installation of IAEA equipment.

6.13 The objectives in this phase should be focussed on confirming that the NMACS systems proposed in the design are being installed and the reporting IT equipment, systems or processes are finalised.

Commissioning phase

6.14 The commissioning phase of a facility begins after completion of construction and before the facility is considered to be operational. This stage will include the use of QNM for testing. Inspectors should ensure the notification requirements set down in NSR19 are met.

6.15 Participation by ONR (as well as the IAEA where necessary to support possible designation of the facility for inspection under the UK/IAEA VOA) in testing activities should be arranged jointly with the operator to enable ONR to gain assurance that the NMACS system declared in the BTC is being operated effectively while minimising the interference on the facility's commissioning phase. The approach taken to commissioning must ensure that ONR can make an independent assessment.

6.16 The objectives in this phase should be focussed on confirming that the NMACS systems installed are being brought on line and set to work, and that testing confirms QNM can be accounted for and controlled proportionately and appropriately.

Operating phase

6.17 The operating phase (routine operations) of a facility begins after commissioning is completed and when QNM has been introduced to the main facility, or support facility, so that it may function for its designed purpose. During the operating phase the major objective of BTC assessment and inspection activities is to ensure that the facility is operating in accordance with the declared design information.

Maintenance / modification phase

6.18 The maintenance / modification phase may involve all or part of a facility. It may also coincide with other phases, such as operating or shut-down phases. The maintenance / modification phase may include design changes to the facility. The major objective of BTC inspection activities during this phase is to ensure any changes to the facility's design, function, operation, and capability, and essential equipment as defined by ONR have been identified and that the modifications to the BTC are implemented.

6.19 Within this phase it is important to recognise that QNM needs to be controlled and accounted for whilst the NMAC systems are going through a variety of changes. Thus the inspector may consider via assessment or inspection whether:

a) The maintenance and / or modifications were appropriate for the declared purpose.

b) The work performed met that specified in the maintenance / modification declared work plan.

c) The integrity of the control measures for QNM were compromised during the period of change.

d) The QNM verification methods were affected by the maintenance / modification work.

e) The declared accounting and relevant operating procedures after the modification / maintenance are correct, appropriate up-to-date and implemented.

f) The use, function, capacity and operational status of Essential Equipment have been modified.

Shut-down phase

6.20 The shut-down phase of a facility involves interrupting the operation of a facility for a period of time significantly exceeding that of normal outages. During this phase, the facility is not in operation, contains QNM and could be restarted in a short time should the operator choose to do so.

6.21 During the shut-down phase, ONR continues with BTC inspection activities to ensure that the operational status of the facility is as declared and that no undeclared changes are made to the facility.

Closed-down phase

6.22 The closed-down phase of a facility begins when operations have been stopped and QNM has been removed, but that decommissioning has not started and the potential for undeclared start up remains. A facility which has been built but never operated and which has no QNM inventory may also be considered to be in a closed-down phase. ONR should still be performing BTC inspection activities during the closed-down phase – and the IAEA will be doing so for facilities that have been designated.

6.23 A closed-down facility may be in either a Care and Maintenance (C&M) phase or a state of decommissioning and as with shut-down the work of the inspector focuses on assurance related to control of QNM.

6.24 A closed-down facility is in a C&M phase when:

a) Major process operations were never started or have been declared as stopped.
b) QNM inventory was never received or have been removed or cleaned out to the extent possible.
c) The installation is not in a decommissioning stage, nor has it been decommissioned.

6.25 BTC inspections are performed during the preservation state to ensure that the facility is not operating and in a preserved closed-down state.

6.26 A closed-down facility is in a state of decommissioning when:

a) It is closed-down as defined for a state of preservation.
b) ONR has been informed of the decision to begin decommissioning.
c) The removal or rendering inoperable of essential equipment has begun.

6.27 BTC inspection activities are performed during this state to ensure that the facility is not operating and to confirm the declared decommissioning activities. ONR can confirm the removal and / or rendering inoperable of the essential equipment (see EEL above) such that the relative difficulty (time and cost) of re-activating or misusing the facility undergoing decommissioning can be assessed. The BTC inspection activities are performed according to the decommissioning schedule as declared by the operator.

Decommissioned for safeguards purposes

6.28 NSR19 includes a definition of “Decommissioned” in relation to a QNF as meaning “a Qualifying Nuclear Facility for which it has been confirmed to the satisfaction of the ONR that residual structures and equipment essential for its use have been removed or rendered inoperable so that it is not used to store and can no longer be used to produce, handle, process, dispose of or utilise QNM”.

6.29 Removal of QNM is therefore an important factor in determining that a facility has been decommissioned for safeguards purposes and this should have already occurred during closed-down phase.

6.30 The operator should provide ONR with the updated information specifying the decommissioned status of the facility. BTC inspection activities will be scheduled by ONR to confirm that the facility has been decommissioned as specified by confirming that sufficient declared essential equipment has been removed or rendered inoperable. Once ONR is able to determine that the facility can no longer be used for its declared purpose, the facility is considered decommissioned for safeguards purposes and inform the operator accordingly.

6.31 ONR will cease to perform BTC assessment and inspection activities once it has concluded that the facility has been decommissioned for safeguards purposes. However, ONR and the operators concerned must bear in mind that the UK/IAEA Additional Protocol includes provisions for IAEA Complementary Access to confirm the decommissioned status of a facility which was designated under the UK/IAEA Safeguards Agreement.

Table 3: Safeguards Inspection Objectives versus Facility Lifecycle

	Life Cycle Phase									
	Pre-construction	Construction	Commissioning	Operating	Maintenance / modification	Shut-down	Closed-down	Post-POCO Care & Maintenance	Decommissioning	Decommissioned for safeguards
Objective										
Financial, technical and human resource requirements for ONR's approach to regulating compliance against NSR19.	Estimate potential	Define	Confirm	Confirm	Amend	Amend	Amend	Amend	Amend	None
Function and capability of the facility. Including planned buildings, locations, declared purpose and use	Become informed	Understand	Confirm	Confirm	Confirm impact of change	Limited Approach	Limited Approach	Limited Approach	Limited Approach	None
Detailed approach of ONR in regulating compliance against NSR19 (e.g. including scope and structures of the MBAs and KMPs, usage and appropriateness of flow KMPs)	Preliminary definition	Finalise approach	Confirm approach	Utilise approach	Amend approach	Limited Approach	Limited Approach	Limited Approach	Limited Approach	None
Operator QNM accountancy and control features in the facility -including material flow routes, material inventory locations	Identify	Understand	Confirm	Confirm	Confirm impact of change	Limited Approach	Limited Approach	Limited Approach	Limited Approach	None
Essential equipment for determining a facility is decommissioned for safeguards purposes (EEL)	Identify	Understand	Confirm	Confirm	Confirm impact of change	Confirm	Confirm	Confirm	Removal including appropriate inspection	None
Material control – appropriate measures identified and in place	Identify where appropriate	Understand	Confirm	Confirm	Confirm impact of change	Identify and understand	Confirm	Confirm	Confirm	None
QNM accountancy and control relevant accounting and operating records and procedures including that they are correct, appropriate and up-to-date, appropriate measurement systems, uncertainties in measurement, expectations against International Target Values for safeguards purposes	Identify where appropriate	Understand	Confirm	Confirm	Confirm impact of change	Identify and understand	Confirm	Confirm	Confirm	None