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| ONR Technical Assessment Guide  Nuclear material accountancy |



ONR Technical Assessment Guide (TAG)

Nuclear material accountancy

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# Introduction

1. The ONR has established guidance in the form of technical assessment guides (TAGs) in the ONR’s role as the state regulatory authority (SRA) for safeguards in the UK to guide regulatory judgements and recommendations when undertaking safeguards assessments of operator submissions.   
   The outcome of the ONR’s assessment is to reach an independent and informed judgement on the adequacy of an operators nuclear material accounting report submission. This TAG contains guidance to advise and inform the ONR’s inspectors in the exercise of their regulatory judgment.
2. Underpinning the requirement for these submissions, and the ONR’s role in their regulation, are the legal duties placed on operators subject to   
   The Nuclear Safeguards (EU Exit) Regulations 2019 (hereafter referred to as NSR19) [1].
3. The IAEA Safeguards Glossary [2] refers to nuclear material accounting as:

“Activities carried out to establish the quantities of nuclear material present within defined areas and the changes in those quantities within defined periods.”

1. It also defines nuclear material accountancy as:

“The practice of nuclear material accounting as implemented by the facility operator and the SSAC, inter alia, to satisfy the requirements in the safeguards agreement between the IAEA and the State (or group of States); and as implemented by the IAEA, inter alia, to independently verify the correctness of the nuclear material accounting information in the facility records and the reports provided by the SSAC to the IAEA.”

1. Nuclear material accounting and accountancy underpins regulatory compliance and informs inspection and assessment activities.

# Purpose and scope

1. This TAG contains guidance to advise and inform the ONR’s inspectors in the exercise of their regulatory judgement during assessment activities relating to data contained within operator inventory change reports (ICRs), material balance reports (MBRs), physical inventory listing (PILs) and special reports required by Regulations 14, 15 and 16 of the NSR19.
2. This TAG also provides appropriate guidance for use during other safeguards inspection and assessment activities, including those activities undertaken to determine operator compliance with the Regulation 29 requirements associated with qualifying nuclear material (QNM) in the form of conditioned and retained waste. The accounting principles provided in this TAG also apply to all qualifying nuclear facilities with limited operation (QNFLO) under Regulation 31, and the principles and guidance in this TAG should be considered proportionately during those activities undertaken to determine operator compliance for QNFLO.
3. This TAG is written as guidance for the ONR’s inspectors to carry out their regulatory duties. It is not written for operators and although it may be used by operators as a source of guidance or good practice, it should not be interpreted by operators as a set of prescriptive legal requirements unless quoted as so.
4. When used in this document the term ‘operator’ should be considered as that defined in Regulation 2 of NSR19:

“operator” means a person or undertaking setting up, operating, closing down or decommissioning a qualifying nuclear facility (QNF) for the production, processing, storage, handling, disposal or other use of qualifying nuclear material (QNM).

# Relationship to the UK voluntary offer agreement and NSR19

1. The UK has a bilateral voluntary offer safeguards agreement (VOA) with the IAEA, INFCIRC/951 [3]. A fundamental requirement in fulfilling the terms of this agreement is the provision of information concerning nuclear material subject to the agreement to the IAEA.
2. This information predominantly takes the form of nuclear material accounting reports as defined by Articles 60-66 of the VOA.
3. As set out in Regulation 42 of NSR19, the ONR has responsibility, on behalf of the UK, for providing timely and accurate nuclear material accounting reports to the IAEA.
4. We obtain the information required for these nuclear material accounting reports directly from UK operators as a result of the requirements placed on them by the NSR19.
5. To achieve sustained delivery of the UK’s obligations under the VOA, the ONR needs to undertake suitable and sufficient assessment of the information provided by UK operators prior to conversion to the required IAEA Code 10 nuclear material accounting format prior to onward transmission to the IAEA.
6. This is achieved in large part by assessing operator compliance with the corresponding NSR19 requirements outlined in Regulations 12, 14, 15 and 16 which require the operator to produce and submit accounting reports for each material balance area using the relevant format defined in Parts 2, 3 and 4 of Schedule 1 of the NSR19.

# Relationship to ONR guidance for the assessment of nuclear material accountancy, control, and safeguards and international standards

1. ONR guidance for nuclear material accountancy, control and safeguards (ONMACS) [4] contains regulatory expectations and associated guidance. The expectations form the underlying basis for regulatory judgements made by the ONR’s inspectors and constitute safeguards relevant good practice.
2. ONMACS is guidance for ONR inspectors, and it provides ONR inspectors with a framework for making consistent regulatory judgements on the adequacy of operators’ nuclear material accountancy, control and safeguards (NMACS) arrangements.
3. Sections of ONMACS will be of relevance to ONR inspectors when assessing operator nuclear material accounting report submissions, in particular, but not limited to:

* MACE 7.2 - Identification of QNM
* MACE 8.2 - Compilation of nuclear material accounts material.
* MACE 9.1 - On/off-site movements of QNM
* MACE 9.3 - Material balance evaluation

# Advice to inspectors

1. Assessment of the nuclear material accounting reports submitted to the ONR in accordance with NSR19 includes comprehensive assessment against prescriptive requirements detailed within the NSR19. In order to facilitate this approach, the Safeguards Information Management and Reporting System (SIMRS) has been developed and includes numerous validation checks that support the assessment of nuclear material accounting reports.
2. SIMRS validation checks focus primarily on the prescriptive formatting requirements of nuclear material accounting reports.
3. SIMRS does not make regulatory judgements on compliance, as such judgements are the responsibility of the inspector.
4. As the prescriptive requirements within NSR19 exist to allow for the UK to meet its international safeguards obligations, including but not limited to the provision of accounting reports to the IAEA and reconciliations of accountancy data with NCA partners, assessment of the nuclear material accounting reports also includes assessment against international requirements.
5. Accounting reports that merely satisfy the prescriptive requirements detailed in NSR19 – but are assessed to nonetheless contain inconsistencies that threaten the ability of the UK to meet its international safeguards obligations – may be judged by the inspector to be shortfalls. The inspector should engage with and influence the operator to submit relevant corrections and/or reports that fully address any shortfalls.
6. Assessments of accounting reports to ensure the ability of the UK to meet its international safeguards obligations may include assessment of changes to particular safeguards obligations, and the operator’s use of obligation pools. In such cases the inspector will also assess against the requirements of any relevant nuclear cooperation agreements (refer to Appendix 3 for details).
7. Assessment should be undertaken of individual nuclear material accounting reports, the collective set of reports that constitute a material balance period (MBP), and reports covering longer periods of time to identify any trends or patterns in the data, in order to assess compliance with NSR19 regulations 12, 14, and 15.
8. The assessment approach outlined may include verification that the nuclear material accounting reports are substantiated by a set of underpinning operating and accounting records either during inspection activities or upon the ONR’s request of information from the operator.
9. Inspection in support of nuclear material accountancy assessment should be against an appropriate sample of the data contained in the operators’ nuclear material accounting reports. Samples may be selected across the full range of accountancy information and/or to target a specific issue   
   (e.g., a particular category or flow of QNM). Inspectors should use statistically-meaningful sampling methods and sample sizes when assessing NMA reports, and to document any relevant detection probabilities.
10. The technical inspection guide (TIG) for safeguards provides additional information on undertaking inspections with a scope covering nuclear material accountancy aspects [5].

## Nuclear material accounting report assessment

1. Inspectors should assess compliance by comparing the nuclear material accounting reports against the prescriptive requirements in NSR19 and then assess the accuracy and adequacy of the declared information based on the expectations set down in ONMACS and references therein.
2. All activities related to the assessment of the nuclear material accounting reports should be captured by the inspector in an appropriate assessment record.
3. Where a shortfall is identified, the assessment record should state the inspector’s judgment on the degree its significance and any proposed enforcement action(s) taken to address the shortfall, which may include advice to the operator.
4. Inspectors should ensure that any shortfalls that are assessed to be regulatory issues, and any resulting actions to be taken by the operators, are managed utilising the ONR regulatory issues process [6].
5. Inspectors should consider other relevant documents to inform the assessment such as the facility attachments (FAs), basic technical characteristics (BTCs), accountancy and control plans (ACPs), joint Government/ONR implementation guidance on new UK nuclear cooperation agreements (NCAs), or any particular safeguards provisions (PSPs) made under Regulation 5 of NSR19.

## Regulatory requirements for accounting reports

1. The inspector should determine, among other things, the following during assessment:

* that the nuclear material accounting reports contain up-to-date information and have been corrected if necessary;
* that the nuclear material accounting reports have been submitted in line with the timeliness requirement outlined within the NSR19 and that they cover the correct reporting period;
* that the nuclear material accounting reports contain weight units expressed to at least the nearest gram, and to a maximum of three decimal places.;
* that the nuclear material accounting reports contain separate line entries for each category of QNM;
* whether all the requirements within a relevant PSP and/or FA have been complied with;
* that nuclear material accounting reports contain appropriate reference to the country and location from, or to which QNM is received or shipped internationally;
* that appropriate reference is included to the material balance area from, or to which QNM is received or shipped domestically;
* that appropriate advance notification references are included when reporting international receipts or shipments to or from the MBA; and
* that corrections entries are reported in line with the regulations, and that any reference to a previous data entry is accurate, transparent and includes appropriate CRC references.

1. The full set of prescriptive requirements associated with nuclear material accounting report format and content is outlined in Schedule 1, Parts 2, 3, 4 and associated explanatory notes of NSR19 and should be considered during assessment.

## Regulatory expectations

1. The nuclear material accounting reports and supporting documentation (such as operating and accounting records) should:

* be representative of the general facility type and more specifically, accurately reflect the BTCs declared for the MBA.
* cover the correct reporting period and in totality provide a continuous timeline for nuclear material accounting within the MBA.
* show that, for each QNM category and obligation arising from relevant international agreements (NSR19 Regulation 19), the book account inventory remains accurately reported in ICRs.
* show that, for each QNM category and obligation, the physical beginning and ending balances declared in the MBR for the MBP accurately reflect the inventory data reported in the corresponding PIL.
* show that, for each QNM category and obligation, the consolidated inventory change data declared in the MBR accurately reflect the individual changes reported in the ICRs for the corresponding MBP.
* contain sufficient information for the operator to demonstrate that, for each QNM category and obligation, non-zero inventory differences (IDs) can be explained by measurement uncertainty and are within tolerance of calculated, technically underpinned action levels.
* show that any reported shipper receiver differences (SRDs) are within tolerance of calculated, technically-underpinned action levels.
* contain accurate inventory data associated with accidental gains or losses of QNM as reconciled against a special report provided to the ONR and that the associated special report reference is included within the “Comments” field of that associated reporting line.
* contain accurate inventory data associated with imports and exports of QNM as reconciled against advanced notifications provided to the ONR, to allow for the ONR to follow up on any relevant transit matching issues identified by the ONR or by the IAEA.
* contain accurate inventory data associated with withdrawals of QNM from safeguards as reconciled against an associated request received by the ONR for which the ONR has provided written consent.
* contain accurate inventory data associated with discards to the environment and terminations of use of QNM. The inspector should also confirm that ONR have provided consent for termination of use.
* be able to be substantiated against operator operating and accounting records (if requested by the ONR) e.g., list of inventory items (LII), measurement data used for QNM inventory quantification, data obtained from calibration of tanks and instruments and from sampling analysis, the procedures employed to control the quality of measurements and the derived estimates of random and systematic measurement uncertainties, etc.
* be able to be reconciled to support the closure or consolidation of MBAs.

1. Additional expectations for nuclear material accountancy are detailed in the appendices.
2. The BTC(s) for a facility should:

* be fully consistent with information in the facility’s ACP.
* provide sufficient information to allow for consistent declaration of NMA information and consistent analysis thereof.

1. The ONMACS provides additional information on ONR safeguards regulatory expectations.

# Appendix 1

## General expectations

### Report and line numbering

All the nuclear material accounting reports will be numbered sequentially (no gaps) per MBA regardless of the type of report. Each line will have its own unique sequential number (no gaps) starting from one in each report.

Example: MBA QXXX reporting the February's ICR, and having a PIT on 14 March

* February's ICR will have report number X (i.e.: 150)
* March's ICR from the first day until the PIT date, report number X+1 (i.e.: 151)
* PIL, report number X+2 (i.e.: 152)
* MBR, report number X+3 (i.e.: 153)
* March's ICRs, from the day after the PIT until the end of month, X+4 (i.e.: 154)

### Accounting reports files: Preferred naming convention

Each nuclear material accounting report is uniquely identified by the information contained in its header.

* MBA\_YYYYMM\_ReportType\_ReportNumber

Or

* MBAMMYYYY-[ReportType][ReportDesignation]
* MBA – The four letter MBA code for which the report covers
* YYYYMM – The four-digit year and two-digit month
* Report Type – The type of report being submitted i.e. I = ICR, P = PIL, M = MBR
* Report Number / Designation – The Report number reported in the header of the report.

## Physical inventory listing (PIL)

The tables below show the labels to be used in PILs, the circumstances in which they should be used and whether their use is required (R), preferred (P) or optional (O).

### Header

The following header labels at report level are all mandatory. They must occur only once per report header.

|  |  |
| --- | --- |
| Field Number | Label/Tag |
| 1 | MBA |
| 2 | Report type |
| 3 | Report date |
| 4 | Report number |
| 5 | PIT Date |
| 6 | Line Count |
| 7 | Reporting person |

### Detail lines

| Field No. | Label/Tag | Entry Status | | | |
| --- | --- | --- | --- | --- | --- |
| New Entry | Late | Addition | Delete |
| 8 | PIL ITEM ID | R | R | R | P |
| 9 | Batch | R | R | R | P |
| 10 | KMP | R | R | R | P |
| 11 | Measurement | R | R | R | P |
| 12 | Element Category | R | R | R | P |
| 13 | Material Form | R | R | R | P |
| 14 | Material Container | R | R | R | P |
| 15 | Material State | R | R | R | P |
| 16 | Line Number | R | R | R | R |
| 17 | Item | R | R | R | P |
| 18 | Element Weight | R | R | R | P |
| 19 | Isotope | R | R | R | P |
| 20 | Fissile Weight | R | R | R | P |
| 21 | Obligation | R | R | R | P |
| 22 | Document | O | O | O | O |
| 23 | Container ID | O | O | O | O |
| 24 | Correction | N/A | R | R | R |
| 25 | Previous Report | N/A | R | R | R |
| 26 | Previous Line | N/A | R | R | R |
| 27 | Comment | O | O | O | O |
| 28 | CRC | R | R | R | R |
| 29 | Previous CRC | N/A | N/A | R | R |

## Inventory change report

### Inventory change (IC) codes and sign convention

For the following inventory change codes, the element and isotope weights reported by the operator should be positive integers but will regardless, be interpreted as positive or negative contributions to the nuclear material inventories depending on the inventory change (IC) Code declared.

| IC Code | Change in inventory |
| --- | --- |
| RD / RF/ RN | Positive |
| SD / SF/ SN | Negative |
| TC | Negative |
| TE | Negative |
| TW | Negative |
| FC | Positive |
| FW | Positive |
| LA | Negative |
| GA | Positive |
| CC / CE/ CB | Positive |
| BR / CR / PR / SR | Positive |
| MP | Positive |
| TU | Negative |

For the following inventory change codes, the element and isotope weights reported by the operator should be positive or negative depending on the required inventory change and will be interpreted accordingly.

|  |  |
| --- | --- |
| IC Code | Change in inventory |
| NP | As declared |
| NL | As declared |
| NM | As declared |
| DI | As declared |
| BJ | As declared |
| MF | As declared |
| RA/R5 | As declared |
| BA | As declared |

### Inventory change report labels

The tables below show the labels to be used in ICRs, the circumstances in which they should be used and whether their use is required (R), preferred (P) optional (O).

### Header

The following header labels at report level are all mandatory. They must occur only once per report header.

|  |  |
| --- | --- |
| Field Number | Label/Tag |
| 1 | MBA |
| 2 | Report type |
| 3 | Report date |
| 4 | Report number |
| 5 | Line count |
| 6 | Start report |
| 7 | End report |
| 8 | Reporting person |

### Detail lines

| Field No. | Label/Tag | Condition | Entry Status | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| New Entry | Late | | | Addition | Delete | |
| 9 | Transaction ID |  | R | R | | | R | R | |
| 10 | IC Code |  | R | R | | | R | P | |
| 11 | Batch | Not required for BA, BJ or MF IC Codes | R | R | | | R | P | |
| 12 | KMP | Not required for BA, BJ or MF IC Codes | R | R | | | R | P | |
| 13 | Measurement Basis | Not required for BA, BJ or MF IC Codes | R | R | | | R | P | |
| 14 | Material Form | Not required for BA, BJ or MF IC Codes | R | R | | | R | P | |
| 15 | Material Container | Not required for BA, BJ or MF IC Codes | R | R | | | R | P | |
| 16 | Material State | Not required for BA, BJ or MF IC Codes | R | R | | | R | P | |
| 17 | MBA From | Required for RD and RF IC Codes | R | R | | | R | P | |
| 18 | MBA to | Required for SD and SF IC Codes | R | R | | | R | P | |
| 19 | Previous Batch | Required when IC Code is RB | R | R | | | R | P | |
| 20 | Original Date | Required when making a correction | N/A | R | | | R | P | |
| 21 | PIT Date | Required only when MF IC Code is reported | R | R | | | R | P | |
| 22 | Line Number |  | R | R | | | R | R | |
| 23 | Accounting Date |  | R | R | | | R | R | |
| 24 | Item | Not required for BA, BJ or MF IC Codes | R | R | | | R | P | |
| 25 | Element Category |  | R | R | | | R | P | |
| 26 | Element Weight |  | R | R | | | R | P | |
| 27 | Isotope | Required if Element category is H or L  or if required by PSP | R | R | | | R | P | |
| 28 | Fissile Weight | Required when Isotope Field is populated | R | R | | | R | P | |
| 29 | Isotopic Composition | If required by PSP | R | R | | | R | P | |
| 30 | Obligation |  | R | R | | | R | P | |
| 31 | Previous Category | Required when IC Codes CB, CC or CE is used | R | R | | | R | P | |
| 32 | Previous Obligation | Required when IC Codes BR, CR, PR or SR is used | R | R | | | R | P | |
| 33 | Document |  | O | O | | | O | O | |
| 34 | Container ID |  | O | O | | | O | O | |
| 35 | Correction |  | N/A | R | | | R | R | |
| 36 | Previous Report |  | N/A | R | | | R | R | |
| 37 | Previous Line |  | N/A | N/A | | | R | R | |
| 38 | Comment |  | O | O | | | O | O | |
| 39 | Burn Up | Required when IC Code NP or NL is used at a Reactor Facility | R | R | | | R | P | |
| 40 | CRC |  | R | R | | | R | R | |
| 41 | Previous CRC |  | N/A | N/A | | | R | R | |
| 42 | Advance Notification | Required when IC Code RF or SF is used in accordance with Regulation 21 and 22 | R | | R | R | | | P |
| 43 | Campaign |  | R | | R | R | | | P |
| 44 | Reactor |  | R | | R | R | | | P |
| 45 | Error Path |  | O | | O | O | | | O |

## Material balance report

### Labels

The tables below show the labels to be used in MBRs, the circumstances in which they should be used and whether their use is required (R), optional (O) or preferred (P).

### Header

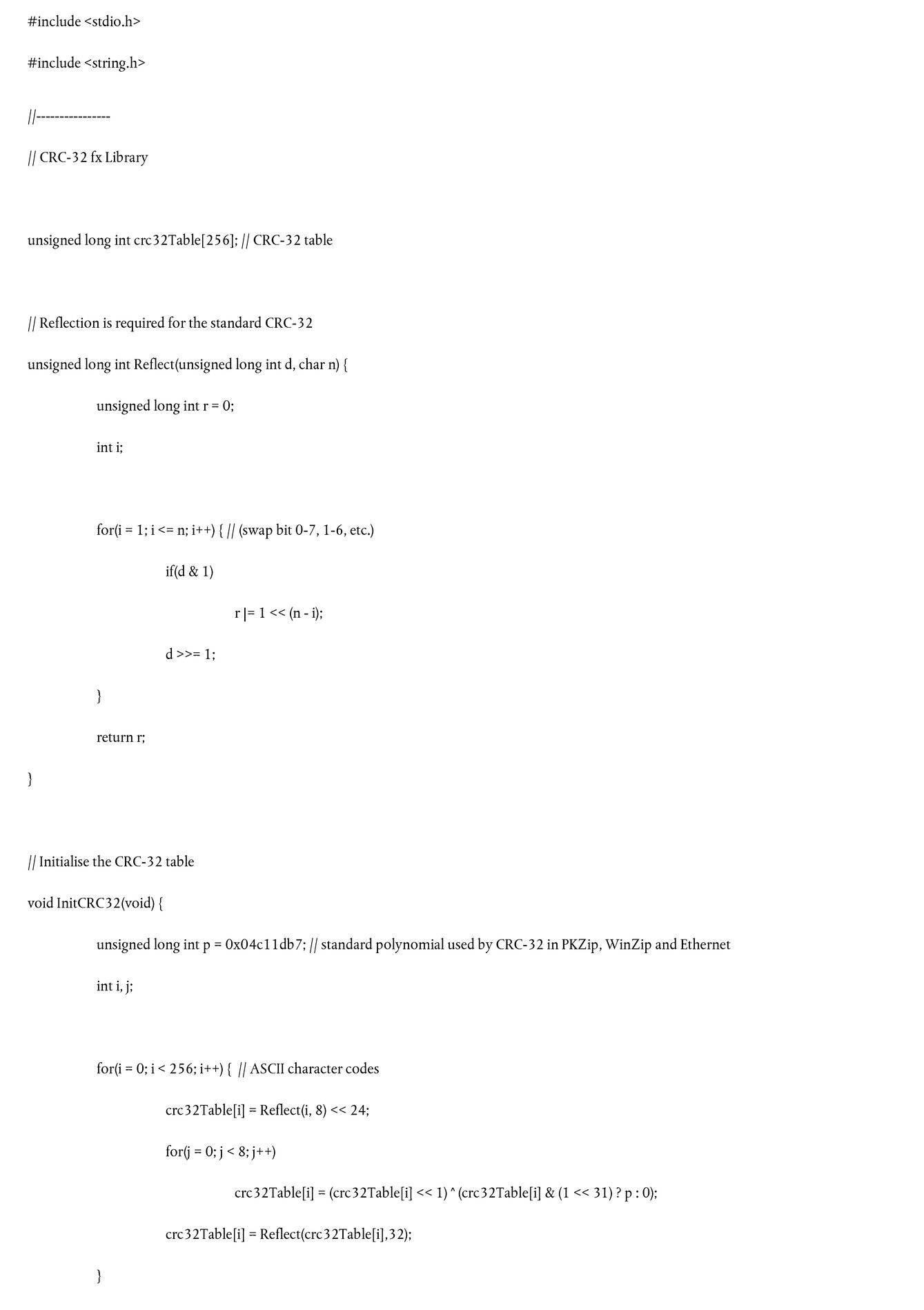
The following header labels at report level are all mandatory. They must occur only once per report header.

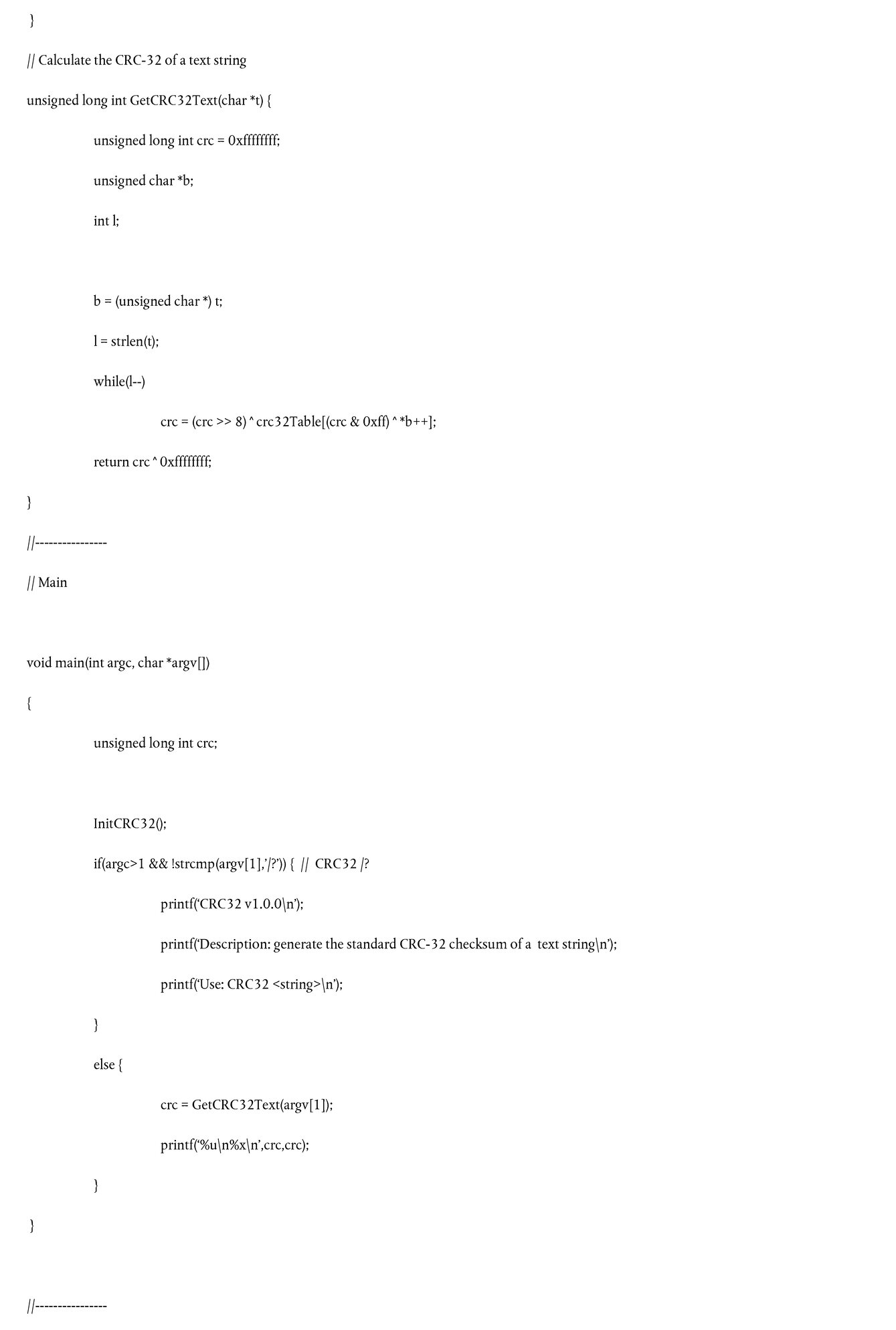
|  |  |
| --- | --- |
| Field Number | Label/Tag |
| 1 | MBA |
| 2 | Report type |
| 3 | Report date |
| 4 | Start Report |
| 5 | End Report |
| 6 | Report Number |
| 8 | Line Count |
| 9 | Reporting person |

### Detail lines

| Field No. | Label/Tag | Entry Status | | | |
| --- | --- | --- | --- | --- | --- |
| New Entry | Late | Addition | Delete |
| 7 | Element Category | R | R | R | P |
| 10 | IC Code | R | R | R | P |
| 11 | Line Number | R | R | R | R |
| 12 | Element Weight | R | R | R | P |
| 13 | Isotope | R | R | R | P |
| 14 | Fissile Weight | R | R | R | P |
| 15 | Obligation | R | R | R | P |
| 16 | Correction | N/A | R | R | R |
| 17 | Previous Report | N/A | R | R | R |
| 18 | Previous Line | N/A | R | R | R |
| 19 | Comment | O | O | O | O |
| 20 | CRC | R | R | R | R |
| 21 | Previous CRC | N/A | N/A | R | R |

### Cyclic redundancy check (CRC) algorithm

The algorithm to be used when generating CRC entries within nuclear material accounting reports is defined in the C example code on the following two pages.  
  




# Appendix 2

## ONR principles of nuclear material accountancy

### Correctness and completeness

Nuclear material accounting reports should convey the most up-to-date, correct, and complete information possible regarding the presence of, changes to, and movement of nuclear material within/between MBAs.

### Inventories and inventory changes

Events requiring the declaration of inventory changes must be declared to ONR in a manner that is consistent with the UK’s domestic and international legal framework, and with current UK government policy.

1. QNM that is found or otherwise identified, which has not previously been declared by an operator, but which in its current form and location would otherwise have been required to be declared on an operator’s initial PIL under Article 1(a) of the UK’s Voluntary Offer Agreement with the IAEA [3], must be reported using inventory change code GA.
   1. Such declarations include all circumstances where QNM, which was not previously excluded from safeguards under Article 1(a) of the VOA, is found or otherwise identified as conforming to the above description.
   2. Such declarations also include all circumstances where QNM, which was previously not subject to safeguards under Article 1(a) of the VOA, and which then entered civil nuclear safeguards using inventory code RN, but after such RN declaration stopped being accounted for by an operator for any reason other than a subsequent declaration of SN or TU, is found or otherwise identified as conforming to the above description.
2. Only QNM that was not previously subject to safeguards under Article 1(a) of the VOA may – and must – be reported using inventory change code RN if it is to become subject to safeguards.
   1. Approval should be sought from the owner of the material prior to its becoming subject to safeguards, and separate notification of such should be provided to the ONR.

Events requiring the declaration of inventory changes should be declared to ONR in a manner that is consistent with international guidance and guidelines produced by the IAEA, including the IAEA Nuclear Material Accounting Handbook [7].

1. The values resulting from an improved measurement of a batch of nuclear material should be declared as corrections to the previously-declared weight(s).
2. Re-batching should be declared whenever possible (to facilitate batch follow-up).
3. Accountancy principles do not change during e.g. POCO and decommissioning activities.
4. Inventory changes should not be used to adjust the book balance of an MBA in a way that is likely to result in double accountancy for the same material.
   1. If material, which is found to be present in – or missing from – an MBA, was likely previously accounted for as a component of a currently-unidentifiable batch that was processed within that MBA, the material’s presence in – and/or movement into or out of – the MBA should be declared in such a way that the quantity of material is reported as a component of material unaccounted for (MF) in the current MBP.
   2. If material is found that was likely *not* previously accounted for as a component of a batch that was present or processed in the MBA, the material’s presence in the MBA should be reported as an accidental gain (GA).
   3. If further information is later identified that materially changes the assumptions made in declarations pursuant to a. or b. above, the previous declarations should be corrected to reflect such newly-identified information. Such corrections may result in additional necessary corrections, e.g.:
      1. Corrections to the amount of material in a batch previously declared shipped from the MBA;
      2. Corrections to a previously-declared shipper-receiver difference;
      3. The deletion of a previously-declared GA to reflect that the material should actually be considered to be a component of MF; and/or
      4. Any other relevant corrections.
5. Retained waste inventories (stock lists) should be equal to material declared transferred to retained waste in the MBA, minus material declared retransferred from retained waste in the MBA (TW – FW).
   1. Discrepancies in waste inventories, if identified, should be accounted for via corrections to the amounts previously declared as transferred to and/or from retained waste, so that any such discrepancies can be identified and are reflected in the MBA’s accounting reports as components of material unaccounted for (MF).
   2. Inventory change codes other than TW and FW should not be used to adjust the book balance of the MBA for discrepancies in retained waste inventories. Any adjustments to the quantity of nuclear material in the retained waste inventory must be reflected in ICRs and MBRs.
6. Transfers to conditioned waste should not normally be declared.
   1. If waste has been conditioned such that it meets the requirements in Appendix 3, consent for Termination of Use (TU) should be requested from ONR. ONR will then engage with the IAEA to determine if the material can undergo TU.
   2. If the requirements in Appendix 3 are not met, the material should remain a component of the book and physical inventories of the MBA (or may be transferred to retained waste).
7. Declarations of Termination of Use (TU) should be agreed with the ONR (refer to Appendix 3) and should include a concise note with a clarification as to whether the material is:
   1. TU(i) – incorporated in end products used for non-nuclear purposes, or
   2. TU(ii) – contained in waste in very low concentrations measured or estimated on the basis of measurements, even if these materials are not discarded to the environment.
8. Batches of QNM that are produced via the concentration of bulk quantities of QNM which have previously been declared TU should be reported using inventory change code Material Production (MP).

# Appendix 3

## A. Exemptions and de minimis reporting levels for QNM

### Exemption

Within Regulation 32 of NSR19 there are two defined exemptions.

1. The requirements of these Regulations do not apply to a person who holds only end products which are used for non-nuclear purposes, and which incorporate qualifying nuclear material that is, in practice, irrecoverable.
2. The requirements of these Regulations do not apply to an operator of a qualifying nuclear facility, which—
   1. is—
      1. a primary or a secondary school, as defined in section 5(1) and (2) of the Education Act 1996(1).
      2. a 16 to 19 Academy, as defined in section 1B of the Academies Act 2010(2): or
      3. a sixth form college, as defined in section 91(3A) of the Further and Higher Education Act 1992(3); and
   2. 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 held.
      * The following are some examples where a Regulation 32(1) exemption is applicable:
        + Uranium or Thorium used in decorative glazes in ceramics.
        + Uranium or Thorium used as colourant in decorative glass.
        + Uranium or Thorium used as coating of filaments for fluorescent lamps or specialist lenses.
        + Thoriated Welding Rods.

### De minimis quantities

Although no de minimis reporting level is defined in NSR19, ONR recognises that there are concentrations or other threshold factors beyond which it is inappropriate and/or disproportionate to account for QNM.

### Concentration

ONR may consider it inappropriate and/or disproportionate to account for QNM that has not been previously accounted for where such QNM is:

1. Present in material, which is nonetheless for non-nuclear use, at concentrations not exceeding:
   * 1 gram in 1,000 thorium;
   * 1 gram in 1,000 depleted and natural uranium;
   * 1 gram in 5,000 of low enriched uranium;
   * 1 gram in 100,000 of high enriched uranium;
   * 1 gram in 250,000 of plutonium; or
   * Any proportional combination of the above; or
2. Present in uranium ores/mineral samples containing less than 0.1% uranium, thorium bearing ores containing less than 3% thorium, and monazites containing less than 10% thorium or 0.1% uranium.

### Other threshold factors

ONR may also consider it inappropriate and/or disproportionate to account for QNM in naturally-occurring materials where recovery of such QNM would be considered impractical due to financial and/or practical constraints, e.g. extraction of trace amounts of QNM in seawater or soil.

### Reporting efficiencies

Where sub-gram quantity items are held in discrete containers and contain higher concentrations of QNM (e.g., metallic uranium or plutonium) than those listed above, the items should be accounted for, especially if there are many such items. A proportionate approach to accounting for this QNM could be to aggregate such items and report them as a single batch with the number of items, provided they share the same QNM characteristics (i.e., the same material description code can be applied).

All QNM item weights should be recorded to the same level of significance (as determined by the sensitivity or capability of the measurement) for the purpose of aggregating and to minimise the impact of rounding.

## B. Discards to the environment and Termination of use

### Use of TE

When QNM is contained in waste, and a quantity of such is measured or has been estimated on the basis of measurements, and that quantity has been irrevocably discarded to the environment as the result of a planned discharge from the reporting MBA, the TE inventory change code should be used. Material is considered to be “irrevocably discarded” if there is an element of dispersal in the discharge. The quantity of QNM is to be removed from the inventory of the reporting MBA.

### Use of TU

The use of the TU inventory change code should be agreed with the ONR in advance of its declaration by the operator as ONR need to engage with the IAEA to determine whether TU is acceptable under the UK’s international obligations before agreeing with the operator. Once its use is agreed, it should then be included in the relevant nuclear material accounting report. The quantity of QNM is then removed from the inventory of the reporting MBA.

The TU inventory change code should be used to report QNM determined (in agreement with the ONR) to have become practicably irrecoverable which is either:

1. incorporated in end products used for non-nuclear purposes, or
2. contained in waste in very low concentrations (as specified in paragraph 11 on the following page) measured or estimated on the basis of measurements.

The TU inventory change code should be declared with a concise note specifying whether the material is being declared as TU(i) or TU(ii).

Specifications [8] for waste which may satisfy the “very low concentrations” requirement of TU(ii) in section 9:

| Maximum concentration (kg/metric ton) of nuclear material in conditioned waste to be declared TU part (ii) | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Pu or 233U | 235U in HEU | 235U in LEU | NU | DU or Th | Pu or 233U | 235U in HEU | 235U in LEU | NU | DU or Th |
| Waste treatment | *Containing fission or activation products at a level requiring processing in a hot cell* | | | | | *Not containing fission or activation products at a level requiring processing in a hot cell* | | | | |
|
| Overpacked, compacted, or treated in any manner presenting a moderate additional recovery effort | 0.01 | 0.03 | 0.09 | 10 | 20 | 0.003 | 0.003 | 0.01 | 1 | 2 |
| Macroencapsulated within a matrix (Polymer, cement, bitumen) | 0.05 | 0.15 | 0.45 | 50 | 100 | 0.015 | 0.015 | 0.05 | 5 | 10 |
| Microencapsulated or incorporated within a matrix (polymer, metal, cement) | 0.5 | 1.5 | 4.5 | 100 | 100 | 0.15 | 0.15 | 0.5 | 10 | 10 |
| Incorporated in a vitrified matrix | 1 | 3 | 9 | 100 | 100 | 0.3 | 0.3 | 1 | 10 | 10 |
| Incorporated in a ceramic matrix | 2 | 6 | 18 | 100 | 100 | 0.6 | 0.6 | 10 | 10 | 10 |

## C. Withdrawals from safeguards

Withdrawals of QNM from civil activities should be reported using the inventory change code SN and must have the ONR’s written consent before being reported in an ICR.

In line with UK policy commitments in INFCIRC/570 [9], withdrawals of QNM from civil activities should only involve small quantities of QNM not suitable for nuclear explosive purposes (e.g., material purchased from civil manufacturers for such uses at defence nuclear facilities as calibration of instruments and radiography and shielding of radiological sources). Information on these withdrawals is published each year on the ONR website.

## D. Correction methods

If corrections to nuclear material accounting reports are required, then they should be undertaken using the following methods only:

* Deleting a previous entry in a nuclear material accounting report
* Correcting a previous entry in a nuclear material accounting report by use of a Delete/Add pair
  + Add entries should only be declared as a part of a Delete/Add pair. Stand-alone Add entries are not permitted.
  + If a single deletion is to be corrected with multiple entries, only the first entry following the deletion should be an addition, to create one Delete/Add pair. Any further entries relevant to the same correction should be Late Lines.
* Adding an entry to a nuclear material accounting report by use of a Late Line

The corresponding codes Delete (D), Add (A) or Late (L) must be reported in the correction field within the nuclear material accounting report.

When a correction is reported, the day, month, and year when the line to be corrected was originally entered must be reported in the original date field.

For correction chains, the original date is always the accounting date of the first line in the chain.

For late lines, the original date is the date on which the inventory change occurred.

## E. Advanced notifications

An advance notification of imports and exports of QNM in excess of one effective kilogram is always required.

Where individual imports or exports of QNM do not exceed one effective kilogram, an advance notification should be provided only if the cumulative total of transfers to another state is likely to exceed one effective kilogram during any consecutive 12-month period.

If one or more advance notifications have been provided for the export of QNM in excess of one effective kilogram to a state, advance notifications should normally be provided for subsequent, additional exports of less than one effective kilogram of QNM to the same state during the following 12 consecutive months.

Where an advance notification is provided, it should be appropriately referenced in the nuclear material accounting reports.

## F. Nuclear material identification and tracking

Batch identification within a PIL should be unique to the reporting MBA (and, wherever possible, the entire facility or site).

Batch identification should be unique to the reporting MBA (and, wherever possible, the entire facility or site) for any transaction on a single date.

The batch identification used by the shipper must be reported by the receiving MBA ICR for the initial receipt of QNM using either RD or RF inventory change codes as appropriate.

Subsequent reporting of changes to the structure or identification of a batch should be reported through use of the RB inventory change code and should be suitably transparent in nuclear material accounting reports to allow batch traceability.

## G. Special reports

Where a special report is required to be reported by the operator in line with the requirements of Regulation 16 of the NSR19, namely.

1. An operator must send to the ONR a special report whenever the circumstances referred to in regulation 17 or 23 arise.

The minimum expectation on content is as follows:

* + The site, location, or premises at which the incident occurred.
  + Date when the incident occurred and / or when the circumstances were established.
  + A description of the actions taken to ascertain the cause of the incident or circumstances.
  + The cause and features of the incident / circumstances.
  + The estimated quantity and characteristics of any QNM which has been gained or lost.

Regulation 17 details those circumstances as being.

1. The circumstances referred to in regulation 16(1) are—
   1. as a result of any unusual incident or circumstances, an operator believes that there has been or might be an increase in or a loss of qualifying nuclear material; or
   2. the containment of qualifying nuclear material has unexpectedly changed to a point where an unauthorised removal of qualifying nuclear material has become possible.
2. An operator must submit a special report **as soon as it becomes aware** of any such loss or increase or sudden change in the containment conditions, or of anything which leads them to believe that there has been such an occurrence

Regulation 23 details those circumstances as being:

* Loss or delay during transfer
* An operator must send the ONR a special report under regulation 16 **as soon as the operator becomes aware** that QNM has been or appears to have been lost during transfer or that there has been a considerable delay during transfer.

As highlighted in the regulatory text above the timeliness requirements for the submission of special reports is as soon as the operator becomes aware.

If the ONR requests further detail or explanation in connection with a special report, the operator must send it to the ONR without delay.

For onward transmission to the IAEA as required by Article 66 of the UK/IAEA Safeguards Agreement the following criteria should be considered:

**Article 66**

The United Kingdom shall make special reports without delay:

* 1. if any unusual incident or circumstances lead the United Kingdom to believe that there is or may have been loss of nuclear material that exceeds the limits specified for this purpose in the Subsidiary Arrangements; or
  2. if the containment of nuclear material subject to safeguards under this Agreement has unexpectedly changed from that specified in the Subsidiary Arrangements to the extent that its unauthorized removal has become possible.

Where facility attachments have been agreed with the IAEA the circumstances in which a special report is required are defined in more detail.

If onward transmission to the IAEA is required then it is to be reported without delay, and in any event within 72 hours following the event.

If the IAEA request amplification and clarification of a special report it should be sent immediately on receipt of IAEA’s request or as soon as possible thereafter.

For special reports that are *not* pursuant to Regulation 16 of the NSR19, but are *only* required by Schedule 1, Part 2 “Inventory Change Report,” Section 10 “IC Code,” Codes GA and LA, the requirement that “Use of this code requires a special report to be sent to the ONR” may be satisfied by the inclusion of a concise note to the GA or LA entry, stating the circumstances around the unexpected find or inadvertent loss of QNM, and referencing any relevant operator records and/or measurements.

## H. Accountancy requirements for nuclear material contained in retained or conditioned waste

### Nuclear material contained in retained waste

When QNM is transferred from the main inventory to retained waste using the inventory change code TW (transfer to retained waste) it should retain any associated obligation code.

When QNM in retained waste is brought back onto the main inventory using code FW (retransfer from retained waste) the original obligation should be associated with the QNM.

QNM in retained waste must be transferred to a specific location within the material balance area from which it could be retrieved.

Limited treatment of QNM in retained waste (e.g. repackaging) can be performed without retransferring the waste to the main inventory. However, if the QNM in retained waste is to be retrieved from its specific location, either for further processing involving the separation of elements or for shipment from the material balance area, it must be retransferred to the inventory of the material balance area.

Operators must maintain operating and accounting records suitable to allow for the book inventory of each category of QNM in retained waste to be accurately established at any time upon request.

Operators are required to undertake an annual PIT, at which point the stock list for QNM in retained waste is to be updated. The QNM in retained waste is not required to be remeasured for the purposes of updating the stock list.

NSR19 does not prescribe requirements relating to the format in which retained waste stock lists should be maintained by an operator. It is nonetheless considered good practice for an operator to be able to provide the ONR with suitable information for each category of QNM such that individual batches can be identified and any subsequent retransfer from retained waste back to the main inventory can be accurately reported.

While the definition of retained waste in NSR19 is relatively broad, it is for the operator to provide sufficient justification to ONR that the QNM transferred to retained waste satisfies this definition. If ONR is not satisfied that the criteria in the definition of retained waste are met, the inspector may judge that operators should retransfer the QNM in retained waste to the main inventory.

### Nuclear material contained in conditioned waste

The requirements of sections 34-35 and 38-41 above apply to conditioned waste as well (substituting “conditioned” for “retained”, “TC” for “TW”, and “FC” for “FW” as appropriate).

QNM in conditioned waste is normally considered as not being subject to IAEA safeguards under the VOA. However, transfers of QNM in conditioned waste into or out of the United Kingdom – while permitted under NSR19 – *may* nevertheless be subject to international reporting requirements. Therefore, ONR discourages transfers of QNM to conditioned waste, and encourages operators to discuss the potential for termination of use of QNM that has been suitably conditioned (see Section 11, above). In any case, early consultation with ONR regarding such QNM is highly encouraged.

## I. Accountancy requirements for obligations and pools

### Changes in particular obligations

NSR19 provides a number of inventory change codes with which operators can declare changes to the obligation associated with a batch of QNM (commonly referred to as “obligation swaps”). As there are no further requirements for such detailed in NSR19, it is for the operator to justify to the ONR that the changes declared are consistent both with the requirements of the relevant nuclear cooperation agreement(s) and with international practice and convention for such changes.

### Obligation pools

NSR19 provides for the use of “accountancy pools” (commonly referred to as “obligation pools”) to track the obligations associated with QNM (BR, CR, PR, SR). As there are no further requirements for such detailed in NSR19, it is for the operator to justify to the ONR that their use of such pools is consistent with the requirements of the relevant nuclear cooperation agreements.

The total amount of QNM in an obligation pool at any given time should be equal to the amount of QNM declared as transferred into the pool minus the amount of QNM declared as transferred out of the pool. Therefore, any corrections to batch weights should be declared to transactions prior to and including the transaction reflecting the batch entering the pool. If an accountancy pool is used for bulk material which is remeasured upon its use in the production of items that leave the pool, the MF resulting from such remeasurement should be reconciled with the pool account, and the obligation(s) associated with that MF should be proportional to the obligations in the pool. Similar proportionality should also be associated with the obligations assigned to declarations of other relevant inventory changes, including (but not limited to) DI / SRD, TE, TU, etc.

# Glossary and abbreviations

AR Assessment Record

BTC Basic Technical Characteristics

FA Facility Attachment

ICR Inventory Change Report

IAEA International Atomic Energy Agency

MBA Material Balance Area

MBR Material Balance Report

NCA Nuclear Cooperation Agreement

NSR19 The Nuclear Safeguards (EU Exit) Regulations 2019

ONMACS ONR Guidance on Nuclear Material Accountancy, Control and Safeguards Assessment Principles

ONR Office for Nuclear Regulation

PIL Physical Inventory Listing

POCO Post-Operational Clean Out

PSP Particular Safeguards Provisions

QNF Qualifying Nuclear Facility

QNFLO Qualifying Nuclear Facility with Limited Operation

QNM Qualifying Nuclear Material

SIMRS Safeguards Information Management and Reporting System

TIG Technical Inspection Guide

TAG Technical Assessment Guide

VOA Voluntary Offer Agreement

# References

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| --- | --- |
| [1] | HM Government, “The Nuclear Safeguards (EU Exit) Regulations 2019,” [Online]. |
| [2] | IAEA, “Safeguards Glossary 2001 Edition - International Nuclear Verification Series No. 3”. |
| [3] | UK/IAEA, “Agreement for Application of Safeguards in Connection with Treaty on the Non-Proliferation of Nuclear Weapons [MS No.13/2018],” 2018. [Online]. |
| [4] | ONR, “ONR Nuclear Material Accountancy Control and Safeguards Assessment Principles (ONMACS)”. |
| [5] | ONR, “SG-INSP-GD-001 - Safeguards Technical Inspection Guidance”. |
| [6] | ONR, “ONR-RIO-PROC-001 - Management of Regulatory Issues”. |
| [7] | IAEA, “Nuclear Material Accounting Handbook,” 2008. [Online]. |
| [8] | International Atomic Energy Agency, “International Safeguards in the Design of Radioactive Waste Management Programs, IAEA Nuclear Energy Series No. NW-T-1.28,” 2023. [Online]. [Accessed 2024]. |
| [9] | IAEA, “Communication Received from the United Kingdom of Great Britain and Northern Ireland - INFCIRC/570,” 21 Sep 1998. [Online]. [Accessed 2024]. |