

**Draft Safety Guide DS420 “Radiation Protection and Safety in the use of Nuclear Gauges”**

**(Version dated 5 April 2018)**

**Status: STEP 11 - Second review of the draft publication by the review Committee(s)**

| COMMENTS BY REVIEWER |                   |  |         | RESOLUTION |  |          |                                     |
|----------------------|-------------------|--|---------|------------|--|----------|-------------------------------------|
| May 2018             |                   |  |         |            |  |          |                                     |
| Com-ment No.         | Para/Line No.     | Proposed new text  | Reason  | Ac-cepted  | Accepted, but mod-ified as follows   | Rejected | Reason for mod-ification/rejec-tion |
| Germany              | General           | The objective of this Safety Guide is to provide recommendations on how to meet the relevant requirements of IAEA “Safety Standards Series No. GSR Part 3, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards” in relation to a specific industrial use.<br>To a large extent, the DS420 equals to DS419 with replacing “well logging tools” by “nuclear gauges”.<br>On the other hand, not all the requirements for radiation sources used either in well logging or in nuclear gauges are harmonised (e.g. Para-graph 2.33 of GSR Part 3 is referenced in DS420 but not in DS419). |         |            | It was discussed in RASSC previous meetings regarding the resemblance of the two documents DS419 and DS420. Harmonization of the two documents for consistency have been checked carefully. The noted oversight will be rectified. |          |                                     |
| USA (R)              | Entire docu-ment  | Consider replacing “stores” with “storage facilities” or “storage containers” as appropriate.  | Clarity | A          |  |          |                                     |
| Germany              | Table of Contents | Some page numbers are incorrectly spaced, e.g. 1. INTRODUCTION - Scope   |         | A          |  |          |                                     |

|              |                        |  |  |   |  |  |  |
|--------------|------------------------|--|--|---|--|--|--|
| India (R)    | Para 1.4(a) line no. 4 | Instead of traditionally used radioactive sources...   | To remove ambiguity  | A |  |  |  |
| Iran (E)     | 1.11/Two last lines    | "...and arrangements for handling preparedness and response for incidents and accidents..."  | In consistent with GSR Part 3 and GSR Part 7   | A |  |  |  |
| Pakistan (R) | 2.2                    | specifies that the prime responsibility for protection and safety rests with the person or organization responsible for facilities and activities that give rise to radiation risks. | Para 2.2 (b) may be in-line with para 2.15 of GSR Part 3   | A |  |  |  |
| Pakistan (R) | 2.5                    | The regulatory body shall establish or adopt regulations and guides for protection and safety and shall establish a system to ensure their implementation.                           | Para 2.5 may be in-line with requirement 3 of GSR Part 3   | A |  |  |  |
| USA (R)      | Para 2.9 Line 9        | "...that provide information — on topics such as on safe work practices..."  | Grammar  | A |  |  |  |
| Germany      | 2.15 (c)               | Measurement of radiation levels around nuclear gauges and <del>confirmation of compliance with authorised levels estimation of the doses to workers and members of the public.</del> | A regulatory body will usually not carry out a dose estimation which would require far more input data than the measurement of a radiation level.<br>The licensee will submit a dose assessment together with the application which will be reviewed by the authority. | A |  |  |  |

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| India (R) | Para 2.15(f).; line no. 2 | Checking the arrangements for the safety and security of each radiation source prior to the installation of the gauge, <b>during its use</b> and after the end of the useful life ...  | “ <b>during its use</b> ” may be added in the sentence   | A |  |   |   |
| USA (R)   | Para 2.40 Line 3          | The reference [8] is not relevant in the context of the paragraph. Recommend removal of the reference.   | Editorial  | A |  |   |   |
| Iran (R)  | 2.42                      | The <u>relevant authority and / or board of societies, NGOs</u> are required to establish requirements for the formal recognition of qualified experts and the government should clearly define which authority or organization or ... has to take responsibility for formal recognition of qualified experts in any special activity. | These requirements are not usually published directly by governments. Such a these tasks should be done by board of societies and or regulatory bodies, NGOs                 |   |  | R | BSS requirement   |
| Iran (R)  | 2.42<br>2.43<br>2.44      | No proposed text, but comment  | The consultancy and part time basis of qualified expert are may be in contradiction with responsibilities mentioned in 2.42  |   |  | R | No clear proposal.  |
| Iran (R)  | 2.45                      | No proposed text, but comment  | If qualified expert has to enter the controlled area then he or she should be considered as a radiation worker in the license.   |   |  | R |   |
| Iran (R)  | 2.53<br>2.54<br>2.55      | No proposed text, but comment  | Licensees shall get required permissions from regulatory body for Such short term workers and the license should be modified to include the name of such short term workers. |   |  | R | Last sentence of the para ensures compliance with regulatory requirements |

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| India (R) | Para 2.56.; line no. 4          | The operating organization should <del>verify</del> ensure that all procedures and other relevant documents are provided in a language understood by the itinerant worker  | Editorial: “ensure” word may be used instead of “verify”   | A |  |   |   |
| Germany   | THE CLIENT 2.57 et seq. General | Is it possible to include requirements for the client organization here? To list obligations of the client is not in the objective of this document.   | The clients’ business is not subject to any authorisation or notification. There is no instrument to enforce such a requirement.               |   |  | R | This would be a problem with the use of the word “Client”. Editor to fix a better wording |
| Germany   | 2.58 / 1-2                      | The client should always use an operating organization that is authorized by the regulatory body in accordance with regulatory requirements for nuclear gauges (see para. 2.25).   | The requirement for authorization is described in para. 2.25 already. The paragraph could also be deleted.                                     |   |  | R | Better description when several interested parties are involved.                          |
| Germany   | 2.58 / 2-5                      | <del>The client should give the operating organization</del> The operating organisation should insist on sufficient time to plan the work and to carry it out safely....   | Rephrase, see General Comment Nr. 6 on THE CLIENT  | A |  |   |   |
| Germany   | 2.59 / 1-2                      | <del>The client should not impose</del> The operating organisation should not accept conditions or limitations that would prevent <del>the operating organization</del> them from performing activities involving nuclear gauges in a safe manner. | Rephrase, see General Comment Nr. 6 on THE CLIENT  | A |  |   |   |
| India (R) | Para 2.62.; line no. 4          | <del>... event of an incident involving the gauge with a potential for exposure of individuals to radiation or in the event of loss of nuclear gauge, the client should extend all necessary cooperation</del>                                     | Client is also required to extend necessary cooperation to operating organization in the event of loss of nuclear gauge to manage the incident |   |  | R | Not clear   |
| Iran (R)  | 2.62                            | To be added to the end of paragraph 2.62. <u>Furthermore</u> The client in any cases (contract problems and vice versa) is not in the position of possession radiation sources and well logging tools.   | It is happening in some MB   |   |  | R | Current text is clearer.  |

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| India (R) | Para 3.2.<br>Line no.2          | Nuclear gauge containing radioactive materials that are of low activity (and which <b>are above exemption level set by regulatory body</b> ) should also be.....               | Modified to bring clarity  | A              |   |  |  |
| India (R) | Para 3.8.<br>(i); line<br>no. 2 | ..... with the objective of <b>detering, detecting</b> , delaying, <del>detecting</del> and responding to the theft of sources .....   | Editorial: “ <b>detecting</b> ” <b>may be written after</b> “ <b>detering</b> ” word | A<br>editorial |   |  |  |
| USA (R)   | Para 3.14<br>Lines 2-3          | Consider replacing “...exposures where these are not certain to be received...” with “...exposures that are not expected to be received...” or “unplanned exposures”           | Clarity  | A              |   |  |  |
| Germany   | 4.5                             | (d) Mechanical hazards (e.g. lifting equipment, rollers <b>and in general harsh working conditions with e.g. removal / transport of raw materials, bulk cargos or scrap</b> ); | Generalisation   |                | A |  |  |
| USA (R)   | Para 4.9<br>Lines 3-4           | “...fostering a positive safety culture.”  | Clarity  | A              |   |  |  |
| Iran (E)  | 4.10/line<br>3                  | "...including any emergency operations response actions (or emergency response)."  | In consistent with GSR Part 3 and GSR Part 7   | A              |   |  |  |
| USA (R)   | Para<br>4.19(b)                 | “Reviews of occupational radiation doses, workplace monitoring program results, and any incident reports...”   | Completeness   | A              |   |  |  |

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| USA (R)   | Para 4.19                 | Consider adding another listed item (after either item a or item b) as a responsibility of the radiation safety committee:<br><br>“Reviews of results of audits on the performance of the radiation protection programme.”   | Completeness   | A |  |  |  |
| USA (R)   | Para. 4.35<br>Line 2      | Recommend replacing “prejudice” with “jeopardize”  | Clarity  |   | A<br>editorial   |  |  |
| India (R) | Para 4.36; line no. 2     | ..... surveillance programme should be confidential, <b>except for the worker</b> , and preserved in a manner...   | The worker has right to know his medical records   | A |  |  |  |
| India (R) | Para 5.5; line no. 4      | ..... in Table 1.  | Editorial: Table 1 instead of Table 2  | A |  |  |  |
| India (R) | After Para 5.9            | TRAINING ASSESSMENTS AND CERTIFICATION<br><br>5.10 Written examinations and practical training sessions on the handling of radiation sources in well logging should be conducted for level 2 personnel. An internal certification of competence by the operating organization is sufficient for level 1 personnel. | Included as provided in DS-419   | A |  |  |  |
| India (R) | Para 6.13.(g); line no. 2 | .... should be promptly processed by the dosimetry service at the end of the period of wear <b>and immediately in case of suspecting high radiation exposure by the individual.</b>  | In case of suspecting high radiation exposure by the individual, the dosimeter should be processed immediately |   | A<br><i>or promptly in case of suspicion of abnormal exposure.</i> |  |  |

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| Pakistan (R) | 6.7                  | “Registrants and licensees shall ensure that the exposures of individuals due to the practices for which the registrants and licensees are authorized are restricted so that neither the.....  | Para 6.7 may be in-line with para 3.28 of GSR Part 3 | A                |                    |   |   |
| USA (R)      | Para 6.8 Line 10     | Since intakes are not expected for workers exposed to well logging sources, restrictions are not necessary for routine work by female workers who are breastfeeding. Consider removing the quotations to allow for removing “or is breast-feeding” from this sentence as well. Further, add closed quotations at the end of (c). | Technical  |                  | A<br>Editor to fix |   |   |
| USA (R)      | Para 6.8 Line 3      | It appears that the superscript 66 is a carry-over copy and paste from the GSR3. Remove the superscript 66 at the end of the line.   | Editorial  | A                |                    |   |   |
| Pakistan (R) | 6.8/10               | “Additional restrictions apply to occupational exposure for a female worker who has notified pregnancy or is breast-feeding (see section 6 of GSG-7 [18] [17]).  | Text editing   | A                |                    |   |   |
| USA (R)      | Para 6.8 Lines 11-13 | Consider removing the entire sentence as it is not necessary for context. If the sentence is not removed, remove the superscript 66 at the beginning of the sentence.  | Editorial  | A<br>66 removed. |                    |   |   |
| USA (R)      | Para 6.13(f)         | Consider adding “and should not be worn by the worker during medical examinations involving radiation exposure.”   | Completeness   |                  |                    | R | Suggested addition may confuse the user |

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| USA (R)      | Para 6.15<br>Lines 1-2 | Active personal dosimeters are designed to prevent overexposures or to warn of high dose rates rather than a tool for keeping doses ALARA. Recommend revising the first sentence to the following:<br>“Active personal dosimeters are a useful tool to warn of high dose rates or to prevent overexposures.”  | Technical                        | A |   |  |  |
| Germany      | 6.16                   | Important considerations in relation to the use of active personal dosimeters include the following: ...<br>(d) Alarm settings of the active personal dosimeters should reflect an appropriate level of either dose or dose rate and the alarm level should be visible during operation of the device.<br>(e) Active personal dosimeters should allow only specific changes in accordance with the role and responsibility of the user. | Please add these considerations. |   | A<br>(d) will be added.<br>(e) not clear. |  |  |
| Pakistan (R) | 6.26/6                 | Recommendations on the testing and calibration of dosimeters and dosimetry equipment are provided in GSG-7 [19] [17].   | Text editing                     | A |   |  |  |

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| Germany      | 7.5       | The operating organization should ensure that a sufficient number of suitable dose rate monitors are made available. While there are many types of monitor for measuring gamma radiation levels, some might not be suitable for accurately measuring low energy photons (e.g. from X ray gauges) <b>at very short exposure times</b> , which could result in a significant underestimation of the dose <del>rate</del> <b>and the dose rate. Monitors should be calibrated in terms of the radiation fields likely to be encountered in the workplace.</b> Specialized monitoring instruments are necessary for the measurement of beta radiation and for the measurement of neutron radiation. Information and guidance on the suitability of monitors should be obtained from manufacturers and from qualified experts. | Calibration should also be included in this paragraph.  | A |           |   |  |
| Germany      | 7.6 / 1-3 | The operating organization should arrange for workplace monitoring instruments to be formally tested or calibrated at periodic intervals <del>(at least annually)</del> by an authorized testing laboratory.  | It is a requirement from ISO QM Norms (e. g. ISO 17025 or ISO 9002) to have an established programme and procedure for the calibration of equipment and to carry out intermediate checks, but these don't have to be "at least annually". |   |           | R | Agree but a minimum interval is suggested. RASSC may decide. |
| Pakistan (R) | 8.5       | Requirement 17 Paragraph 3.53 of GSR Part 3 [9] states that.....  | Correction may be made as proposed.   |   | editorial |   |  |

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| Germany      | 8.6.                    | As well as maintaining the inventory records described in para. 8.5, the operating organization should conduct periodic accountancy checks of its sources, to confirm that they are in their assigned locations, <del>and</del> are secure, <b>that warning signs are visible and the source can be identified without problems.</b>                                    | Based on a very recent experience that included a source that was lost as it was simply not clearly visible anymore because of a thick layer of dirt and rust. | A |  |  |                       |
| Pakistan (R) | 10.2                    | A wide range of radiation sources are used in nuclear gauges, including radioactive sources (emitting beta, gamma or neutron radiation), and X ray and neutron generators. Details are provided in Annexes I and II.  | Text editing   |   |  |  | Not clear             |
| India (R)    | Para 10.6.; last line   | ..... by a qualified expert to determine whether any additional safety measures should be implemented <b>and regulatory clearance is obtained for use of such gauge.</b>  | Such gauges should be brought under regulatory scrutiny prior to their use   | A |  |  |                       |
| Germany      | 10.24                   | Under normal operating conditions it should not be possible for workers operating X ray equipment to expose any part of the body to the primary X ray beam. If it is suspected that such an exposure has occurred, appropriate emergency response action (see Section 13) should be initiated immediately. <b>Attention should also be paid to scattered radiation.</b> | Please add also the scattered radiation.   | A |  |  |                       |
| India (R)    | Para 10.30.; line no. 6 | .... maintenance work should be made aware of the radiation hazards and should be appropriately trained and the person should preferably from manufacturer / supplier.  | Maintenance of Nuclear Gauge should be carried out by the trained person from manufacture / supplier   |   |  |  | Need opinion of RASSC |

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| Pakistan (R) | 10.32                     | As stated in para. 3.60 of GSR Part 3 [9], the operating organization:<br>10.33. "shall ensure that arrangements are made promptly for the safe management of and control over radiation generators and radioactive sources, including appropriate financial provision, once it has been decided to take them out of use."   | Text editing   | A |   |  |  |
| USA (R)      | Para 10.34                | Recommend adding the following item to the list as (f) in paragraph 10.34:<br>"An option for disposal of sealed sources in nuclear gauges is "Borehole Disposal." IAEA TECDOC-1644 provides a technical manual on borehole disposal of disused sealed sources. IAEA SSG-1 is a specific safety guide on borehole disposal facilities for radioactive waste."                 | Completeness to refer to "Borehole Disposal" option approach and technical documents and guidance.   | A |   |  |  |
| USA (R)      | Para 10.34 (e)            | "...Research and Education [32], or corresponding national standard, and in accordance with regulatory requirements."  | Completeness and flexibility to use corresponding national standards. This is due to possible different waste classification system and disposal procedures. | A |   |  |  |
| USA (R)      | 10.35<br>Line 2-3         | Modify Para 10.35 to read:<br>"...If this is the case, decommissioning and disposal of the old sources should be arranged according to the requirements specified by the regulatory body. It is noted that decommissioning of old-design nuclear gauges should be arranged with regulatory body and according to the relevant safety design and operational safety records." | Completeness and Update to integrate decommissioning and waste disposal options for superseded nuclear gauges.   | A | A<br>Appropriate text considering the suggestion will be added. |  |  |
| India (R)    | Para 11.13;<br>line no. 5 | A suitable storage facility should provide protection from the prevailing environmental conditions and should also provide an adequate level of safety <b>and security</b>   | "Security" word may be added   | A |   |  |  |

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| USA (R)      | Para 11.13<br>Line 3 | Consider the following revision:<br>“...level of protection, and safety, and security as storage facilities...”   | Completeness | A |           |   |  |
| Pakistan (R) | 12.1                 | Nuclear gauges containing radioactive sources will are need to be transported:  | Text editing |   | editorial |   |  |
| Turkey       | 13.1                 | The first and the third paragraphs of the “emergency” definition have more or less similar meanings and either they can be combined into one paragraph or one of these paragraphs can be deleted from the text.   |              |   |           | R | First one is more general and the second is specific- radiological |
| Turkey       | 13.3                 | The following statement: “Higher dose rates than expected” can be written as “Abnormal and higher dose rates than expected”   |              | A |           |   |  |
| Turkey       | 13.4                 | The following statement: “Should use calibrated workplace monitoring instruments before, during and after every source use” should be written as “Should use calibrated workplace and personnel monitoring instruments before, during and after every source use” |              | A |           |   |  |
| Turkey       | 13.4                 | The following statement: “Should make proper use of emergency equipment” ” should be written as “Should make proper use of emergency and personnel protection equipment”  |              |   |           | R | PPE covered in section 4.  |
| Turkey       | 13.5                 | The local, regional and national radiation emergency plans can also be mentioned in terms of efficiency of emergency response.  |              |   |           | R | These are part of the emergency plans                              |

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| Pakistan (R) | 13.7            | Emergency preparedness category IV, as described in table Table I of GSR Part 7 [40],   | Text editing   | A |  |   |                    |
| Germany      | 13.8/1          | The emergency response plans for nuclear gauges should address scenarios such as a missing or lost source ...   | “emergency plan” is an accepted expression of the IAEA SAFETY GLOSSARY; please change “emergency response plan(s)” to “emergency plan(s)” also in paras. 13.9 line 3, 13.11 line 1, 4 and 6, 13.21 line 2, 13.24 line 2. | A |  |   |                    |
| Turkey       | 13.8            | - Use of radiological monitoring equipment can be added to emergency procedures.  |  |   |  | R | Not to the context |
| Iran (E)     | 13.8/First line | "The emergency response plans for nuclear gauges.."   | In consistent with GSR Part 3 and GSR Part 7   |   |  |   | Not clear          |
| Iran (E)     | 13.9/Third line | "...emergency response plans actions (or emergency response actions) are provided..."   | In consistent with GSR Part 3, GSR Part 7 and GS-G-2.1.  |   |  |   | Not clear          |
| Pakistan (R) | 13.11           | Implementation of the on-site emergency response plans and procedures may require off-site support (e.g. off-site response organization, emergency services, radiation protection specialists, law enforcement authorities in the event of theft of source) as addressed in GSR Part 7 [41] [40] and GS-G-2.1 [41]. | Text editing   | A |  |   |                    |

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| Iran (E)  | 13.11/Fir<br>st line          | "Implementation of the on-site emergency re-<br>sponse plans ..."   | In consistent with GSR<br>Part 3 and GSR Part 7   |   | A<br>Implementation of<br>the on-site emer-<br>gency plans  |   |   |
| Iran (E)  | 13.11/Li<br>ne 6              | "In particular, the on-site emergency response<br>plan ..."   | In consistent with GSR<br>Part 3 and GSR Part 7   |   | A<br>Implementation of<br>the on-site emer-<br>gency plans  |   |   |
| Turkey    | 13.12                         | The emergency plan of the operating organiza-<br>tion should be compatible with the emergency<br>plans of the off-site authorities. This point can<br>also be mentioned in this paragraph.  |   |   |   | R | Not clear   |
| Turkey    | 13.14                         | The following equipment can be added to the<br>equipment list:<br>- Personnel protection equipment<br>- Materials and agents for decontamination  |   |   |   | R | Important items<br>are listed and<br>not limited to.. |
| Turkey    | 13.15                         | Decontamination can also be mentioned in this<br>paragraph.   |   | A |   |   |   |
| India (R) | Para<br>13.15.;<br>line no. 6 | If it is known or suspected that a source capsule<br>has ruptured, the operating organization should<br>promptly seek advice and assistance from a<br>qualified expert. Further, operating organization<br>may seek assistance of a trained expert from<br>manufacturer / supplier to mitigate and report<br>the incident to regulatory body. | Handling / assisting in<br>case of radiological<br>emergency is one of the<br>responsibility of manu-<br>facture / supplier           |   | A<br><i>Further, operating<br/>organization may<br/>seek assistance of a<br/>trained expert from<br/>manufacturer / sup-<br/>plier.</i> |   |   |
| Iran (E)  | 13.16/Li<br>ne 7              | "...and the postulated accident scenarios based<br>on ..."  | Considering the defini-<br>tion of "Scenario" in<br>GSR Part 3:<br>"A Postulated or as-<br>sumed set of conditions<br>and/or events." |   |   | R | No clear text<br>proposal                             |

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| Turkey   | 13.17             | - "Use necessary personnel protective equipment"<br>can be added to the list  |   | A |  |   |  |
| Iran (E) | 13.18/Item (a)    | "Plan Implement a specific course of action on the basis of previously established emergency plans and procedures ..."  | Wording<br>Considering Requirement 23 of GSR Part 7 | A |  |   |  |
| Iran (E) | 13.18/Second line | "Plan Implement a specific course of action on the basis of previously established emergency plans and procedures ..."  | Wording<br>Considering Requirement 23 of GSR Part 7 | A |  |   |  |
| Turkey   | 13.19             | - "Use necessary personnel protective equipment"<br>can be added to the list  |   | A |  |   |  |
| Iran (E) | 13.21/Second line | "...implementing the emergency response plans actions..."   | Considering 5.44 of<br>GSR Part 7                   | A |  |   |  |
| Turkey   | 13.24             | Consistent terminology should be used: "emergency response plans" or "emergency plans"  |   | A |  |   |  |
| Turkey   | 13.24             | Paragraphs 13.24 and 13.25 can be combined since these paragraphs state similar provisions. Incorporation of operating experience for the revision of plans and procedures can also be stated in the revised paragraph. |   |   |  | R |  |

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| Turkey       | 13.29              | In some cases, performance of the communication with public during emergency situations by operating organization may be impossible, inappropriate or inconvenient (due to heavy work load of operating organization or related provisions present in national legislation). Due to this reason, this paragraph can be rewritten by pointing-out the possibility of performance of the communication with the public by off-site authorities also. In this case, importance of performance of public communication from one source (from a center or a point) to avoid inconsistent and misleading information should also be emphasized. |              |           |  | R | Reference to relevant documents have already been given. |
| USA (R)      | Page 90: Table I-1 | Recommend a definition or a reference for “D-value.”  | Completeness | A         |  |   |  |
| Pakistan (R) | II-7               | In terms of the sources listed in table Table II-1:   | Text editing | editorial |  |   |  |
| Unknown      |                    | A document was uploaded on 24 May 2018 but there is an error message showing  |              |           |  |   | ?  |