Draft Safety Guide DS469: Preparedness and Response for an Emergency during the Transport of Radioactive Material

Step 7: Approval by the relevant review Committees for submission to Member States for Comments

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S. Whittingham, NSRW
Background - Document

- Revision of TS-G-1.2 (2002)
- DPP approved by EPReSC, TRANSSC, RASSC, NSGC June 2016
- DPP approved by CSS November 2016
Background - Experts

• Writing team of experts in transport safety & emergency preparedness and response
  – Open call for experts at EPR'eSC, TRANSSC, RASSC, NSGC, and CSS
  – Formed November 2016

• Experts from:
  – Canada (2)
  – France
  – India
  – Japan
  – Portugal
  – UK
  – USA
  – WNTI (2)
Background - CS

- 6 Consultancy Meetings held
  - June 2016
  - November 2016
  - February 2017
  - June 2017
  - September 2017
  - January 2018

- Events jointly implemented by IEC and Transport Safety Unit
Background – TM

• Technical Meeting held 16-20 October 2017
• 62 representatives
  – 43 Member States, 1 International Organization, 1 Nongovernmental Organization
• Conclusions:
  – Welcomed the current draft DS469 as a revision of TS-G-1.2.
  – The draft DS469 fully meets the intent of the DPP. No missing aspects were identified.
  – The meeting participants considered the current draft to be clearly written and comprehensive.
  – The meeting participants noted and welcomed that the current draft reflects past experiences and lessons learned from previous emergencies.
  – Many countries identified the complexity associated with the implementation of the necessary technical and operational arrangements in the preparedness stage and the need to cooperate with many different organizations. The document was considered as good guidance to start or continue the necessary discussions at national level.
  – The current draft accurately reflects a balance of preparing for emergencies during transport, while noting the requirements established in SSR-6 and the strong safety record of consignors and carriers worldwide.
  – The current draft provides guidance and recommendations for all Member States, while noting that the adoption and implementation of Member State plans and procedures may vary slightly.
• The Technical Meeting used virtual reality (VR) technology to provide an additional method for attendees to review the suitability of the templates and checklists in DS469
• 4 scenarios developed: Two road, rail, and maritime
Background – Guiding Principles

- Easy to understand, user friendly publication
- Focus on most probable emergencies while acknowledging and allowing for more severe emergencies
- Elaborate linkages between concepts whenever possible
  - E.g., External Radiation Levels (SSR-6) and Operational Intervention Levels (GSR Part 7)
- Provide more specific guidance on roles and responsibilities of consignors and carriers
- Provide examples, templates, and references whenever possible
  - 4 appendices and 3 annexes are > 50% of the length of the document
Scope

• Preparedness and response for a nuclear or radiological emergency during transport
• From the forwarding of the package to delivery at the consignee (including storage in transit)
• Excludes:
  – Events without any safety significance (e.g. a disabled conveyance in a stable condition, such as a broken down motor vehicle or a vehicle involved in a minor traffic accident)
  – Movement of radioactive material within the site boundaries of authorized facilities
Proposed Structure

- Section 1: Introduction
- Section 2: National Arrangements and Framework
- Section 3: Preparedness and Response Elements
- Section 4: Considerations for Modes of Transport
- Section 5: Interface with Nuclear Security
- Appendix I: Features of the Transport Regulations Relevant to EPR
- Appendix II: Considerations for Developing a National Capability
- Appendix III: Types of Emergencies during Transport
- Appendix IV: Postulated Events and Potential Consequences
- References
- Annex I: Example Event Notification Form
- Annex II: Sample Emergency Instructions
- Annex III: Template for the Carrier and Consignor Emergency Response Plan
EPR Primer for TRANSSC
GSR Part 7

• Published November 2015
  – Replaces GS-R-2 from 2002
• Includes 26 Overarching Requirements assigned to
  – international organization,
  – governments,
  – regulators,
  – operating organizations,
Goals of Emergency Response

• To **regain control** of the situation and to mitigate consequences
• To **save lives**
• To avoid or to minimize severe **deterministic** effects
• To render **first aid**
  – Provide critical medical treatment
  – Manage the treatment of radiation injuries
• To reduce the risk of **stochastic** effects

Images courtesy IAEA
Goals of Emergency Response (cont.)

• To keep the public informed and maintain public trust

• And to the extent practicable:
  – To mitigate non-radiological consequences
  – To protect property and the environment
  – To prepare for the resumption of normal social and economic activity
Emergency Preparedness Category IV

• Activities and acts that could give rise to a nuclear or radiological emergency that could warrant protective actions and other response actions to achieve the goals of emergency response in accordance with international standards in an unforeseen location. These activities and acts include: (a) transport of nuclear or radioactive material and other authorized activities involving mobile dangerous sources such as industrial radiography sources, nuclear powered satellites or radioisotope thermoelectric generators; …
Operating organization

• Any organization or person applying for authorization or authorized to operate an authorized facility or to conduct an authorized activity and responsible for its safety. This includes, inter alia, private individuals, governmental bodies, **consignors or carriers**, licensees, hospitals and self-employed persons. ‘Operator’ includes either those who are directly in control of a facility or an activity during use of a source (such as radiographers or carriers) or, in the case of a source not under control (such as a lost or illicitly removed source or a re-entering satellite), those who were responsible for the source before control over it was lost.
Hazard Assessment

• GSR Part 7 Requirement 4
• **hazard assessment.** Assessment of hazards associated with facilities, activities or sources within or beyond the borders of a State in order to identify:
  
  (a) Those events and the associated areas for which protective actions and other response actions may be required within the State;
  
  (b) Actions that would be effective in mitigating the consequences of such events.

• National level activity in the preparedness stage; not an on-scene response activity
Generic Criteria

• Generically justified and optimized levels (on radiological protection grounds) at which emergency response actions need to be taken (individually or in combination)

**Projected dose**
Basis to implement emergency response actions (e.g. evacuation)

**Received dose**
Basis to implement medical actions (e.g. medical follow up)
Generic Criteria

• Below GC:
  – There will not be any severe deterministic effects or an observable increase in the incidence of cancer (even in a very large exposed group)

• Consistent with UNSCEAR 2000 and 2010:
  – Observations are frequently unable to reveal clear evidence of an increased incidence of radiation induced health effects at low doses (less than 100-200 mGy)
Operational Criteria

**GENERIC CRITERIA**

- Conditions on-scene
- Abnormal facility conditions
- Field and laboratory measurements

**Observables/Indicators**
- Emergency Action Levels (EAL)
- Operational Intervention Levels (OIL)

**ACTIONS**
Basis for OILs

RESPONSE PHASE

MEASURED QUANTITY

DEFAULT OILS

RESPONSE ACTION

PREPAREDNESS PHASE

Consider the expected radionuclide mixtures

Determine the exposure scenarios and relevant exposure pathways

Consider all the important exposure pathways

Consider all members of the public (including the most vulnerable)

Consider the behaviour of the radionuclides

Determine the relevant dose conversion factors and perform all relevant organ dose calculations

Compare the calculated doses with generic criteria at which response actions need to be implemented

Consider the emission rate and monitoring instrument response
Comment Resolution
Comments received by MS - 236

- France 158
- Japan 5
- Germany 8
- Pakistan 4
- Spain 9
- Spain 24
- Turkey 24
- IATA 20
- Iraq 8
## Comments Received by Committee

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Comments Received by Section

General: 8
Section 2: 14
Section 3: 112
Section 4: 41
Section 5: 25
Appendix I: 8
Appendix II: 19
Appendix III: 3
Appendix IV: 3
Annex I: 1
Annex II: 3
Annex III: 2
Paragraph/Line: General and title

Proposed new text: “Preparedness and to Respond to an Emergency during the Transport of Radioactive Material”

Reason: With a few exception, the draft addresses preparedness to respond to an emergency, not the response itself

Reason for modification/rejection: Title approved in the DPP and is consistent with GSR Part 7 "Preparedness and Response for a Nuclear or Radiological Emergency"
• **Paragraph/Line:** Appendices
• **Proposed new text:** Transform all appendixes in annexes
• **Reason:** Appendix I, as a summary, therefore a subset with rewording, and can not have the same status as SSG-26 or SSR-6. Appendix II is material to help some states to implement the recommendations of the guide. It also has a strong interface with the management of any emergency, thus the general EPR Safety Guides. Most paragraphs are not really transport specific. Appendix II gives a partial view of emergencies to be considered as malevolent acts are not considered (see III.2). Furthermore, guidance on combination of events is not provided. Appendix III includes a closed list of scenarios and topics to be addressed in the hazard assessment. It also gives assumptions for the scenario and hazard assessment. This should not be seen as the only scenarios to be considered, nor the only assumption to take…
• **Reason for modification/rejection:** The appendices and annexes were determined based on what should be an integral part of the document and what is able to be separated. For example, changing Appendix I to an Annex would mean that it could be separated from the Guide and used on its own, which is incorrect and potentially dangerous.
Of the plans and procedures {And another organization for approval.}.

Reason: Add, it seems to be more accurate.
Reason for modification/rejection: Changes intent
(c) Arrangements are in place to respond to the loss or theft of radioactive material during transport. Once material has been lost during transport it should be treated as material out of regulatory control and appropriate guidance from the IAEA Safety Standards Series and the IAEA Nuclear Security Series should be considered.”

Reason: Superfluous as beyond transport

Reason for modification/rejection: Important linkage to other IAEA publications
IRQ-3

• **Paragraph/Line:** 2.16 / 3
• **Proposed new text:** “Of radioactive Materials and *other Dangerous goods*”
• **Reason:** Add, It seems to be more accurate
• **Reason for modification/rejection:** Recognition of other dangerous goods is outside the scope of the publication
Paragraph/Line: 2.18

Proposed new text: “The consignor should ensure that, before undertaking the transport of radioactive material, carriers are provided with and aware of the instructions to be followed in case of a transport emergency. {This is the existing text. I have no proposed solution.}”

Reason: For air transport it is doubtful if the consignor has the competence to advise on the steps to be taken in the event of an aircraft incident or accident.

Reason for modification/rejection: An emergency in this publication is defined as nuclear or radiological emergency unless otherwise specified, and Section 1 limits the scope, so this sentence is accurate. The guidance here is not on how to respond to an aircraft incident, but instead, the nuclear or radiological hazards.
Proposed new text: No new text proposed

Reason: In the dangerous goods regulations, there is no obligation for carrying on the conveyance other instructions regarding the emergency preparedness than the “instructions in writing”. For an obligation in this case transport regulations (SSR-6) have to be modified.

Reason for modification/rejection: The sentence merely states “provided with” and is consistent with SSR-6 (2012) para 554
The consignor should make arrangements with relevant organizations, which could include private companies, to ensure that emergency arrangements are in place throughout the duration of the transport, through all territories, taking account of the possibility of multiple modes of transport for one shipment.

Reason: Is this truly practicable?

Reason for modification/rejection: The next sentence, in the same para, includes guidance that this should be applied in a graded approach, so yes, it is practicable.
2.20

Proposed new text: “The consignor should make arrangements with relevant organizations, which could include private companies, to ensure that emergency arrangements are in place throughout the duration of the transport, through all territories, taking account of the possibility of multiple modes of transport for one shipment. These arrangements may be necessary based on distances, languages, applicable jurisdictional requirements or other factors of the shipment. The overall responsibility remains with the consignor.”

Reason: Superfluous

Reason for modification/rejection: Edited for clarity based on comment ESP-2, which makes it not superfluous
Paragraph/Line: 2.21

Proposed new text: “The carrier should ensure that written emergency instructions applicable to the material being transported are carried on board the conveyance”

Reason: This needs much more thought, particularly for air transport where if the emergency instructions are carried on board the aircraft they will not be available in the event of an accident.

Reason for modification/rejection: It is foreseen that they could be destroyed, as referenced in the document, but that does not mean they shouldn’t be carried, as often times they are not destroyed (see FRA and ESP comments).
FRA-30

- **Paragraph/Line:** 2.24
- **Proposed new text:** “As part of the emergency arrangements, a trained and equipped radiological assessor should be available to assess the radiological consequences of an emergency. Radiological assessors should be trained and qualified in their necessary functions, including radiation safety, assessing containment, radiation and contamination measurements, and emergency response. Depending on the results of the hazard assessment, the radiological assessor may also need to be trained in the prevention of criticality.”

- **Reason:** This is not relevant for an off-site assessor. Superfluous
- **Reason for modification/rejection:** Equipment and qualifications are important points under GSR Part 7
• Paragraph/Line: 2.24 / 2
• Proposed new text: “an emergency \{ and be part of the transport team \},”
• Reason: Add, “or any other means”
• Reason for modification/rejection: Transport team is not a term that is used in Safety Standards.
  – Ed Note: full sentence reads: “As part of the emergency arrangements, a trained and equipped radiological assessor should be available to assess the radiological consequences of an emergency.”
There are multiple values of sources used for the transport of radioactive material and emergency preparedness and response. The $A_1$ and $A_2$ values, defined in the Transport Regulations [4] are used “to determine the activity limits for the requirements of these Regulations” [4]. Similarly, in emergency preparedness and response, $D$ values have been developed to specify “the radionuclide specific activity of a source which, if not under control, could cause severe deterministic effects for a range of scenarios that include both external exposure from an unshielded source and internal exposure following dispersal of the source material” [31]. The $A_1$ and $A_2$ values should be used to determine required package types with the goal of applying the graded approach of the Transport Regulations [4] to shipments and withstanding accident conditions of transport, as appropriate. $D$ values [31] should be used for determining the extent of the necessary emergency arrangements in line with the graded approach for emergency preparedness and response, in line with GS-G-2.1 [14].”

**Reason:** Superfluous. The recommendation is given in the last two sentences.

**Reason for modification/rejection:** Important context
• Proposed new text: “radioactive material { and sources }”
• Reason: Add, it was not clear the scope of the sentence written in the text.
• Reason for modification/rejection: Sources are covered under material
2.42. Proposed new text: “During routine and normal conditions of transport, dose rate measurements in excess of the Operational intervention levels (OILs) should not be used as a justification to declare an emergency class and trigger emergency response actions. When dose rate measurements show that OILs are exceeded, they should be compared with the measurements recorded at the beginning of the shipment process (e.g. transport index) and other observables and indicators, to help identify abnormal conditions and trigger emergency response actions, if appropriate.”

Reason: Superfluous considering the second sentence.
Reason for modification/rejection: Left in for clarity
• Paragraph/Line: 2.45
• Proposed new text: Delete 2.45
• Reason: Duplicates 2.11 and 2.17
• Reason for modification/rejection: Not duplicative as the other paras cover only roles & responsibilities
  – Ed Note: (original) 2.45 reads: “The national arrangements for emergency preparedness and response for transport should incorporate the responsibilities of both domestic and foreign consignors and carriers, as applicable. The emergency arrangements of the consignor and the carrier should be consistent with the national arrangements of all the States relevant to their shipments.”
2.46. The Transport Regulations [4], summarized briefly in Appendix I, are applied to shipments throughout the world, either directly via national regulations or by way of the requirements of relevant international modal organizations. The Transport Regulations [4] require that emergency arrangements, as established by the relevant national or international organizations, be observed to protect human life and health, property and the environment.

Reason: The summary of regulatory requirements listed in Appendix I is not considered necessary. It would be enough to refer to the current edition of the IAEA Transport Regulations (SSR-6). In addition, in case of future changes of the SSR-6 requirements, the Guide would need to be updated.

Reason for modification/rejection: Consistent with TS-G-1.2 and requests from SSCs to include
Paragraph/Line: 2.49
Proposed new text: Delete 2.49
Reason: This is already covered by 2.48 as modified
Reason for modification/rejection: The paragraph provides clarity on specific circumstances not directly addressed elsewhere.

– Ed note: (original) 2.49 reads: “Additional plans and procedures should be developed for specific shipments. This will depend primarily on the material being transported. These plans and procedures should be consistent with the existing plans and procedures.”
Emergency arrangements for all organizations should be coordinated and integrated with the arrangements for the response to a nuclear security event during the transport of nuclear or radioactive material [5, 6].

Reason: Simplification
Reason for modification/rejection: “address” is not consistent with the IAEA safety standards or nuclear security series.
IATA-7

- **Paragraph/Line:** 2.56
- **Proposed new text:** “Consignors and carriers conducting international shipments should ensure that their emergency arrangements are compliant with the requirements of each State through which they conduct shipments. [This is the existing text. I have no proposed solution.]”
- **Reason:** This is completely impractical. For air transport the air carrier will have a corporate emergency response plan. For airports at which the air carrier regularly operates the carrier will be part of an airport emergency response planning group. It is expected that the airport operator coordinate with local authorities to ensure that all possible hazards are addressed.
- **Reason for modification/rejection:** The corporate emergency response plan must be consistent with the States being transited. No new requirement being established here.
Consignors and carriers should develop plans and procedures, as appropriate, for emergencies during transport of radioactive material, commensurate with the hazard assessment. The arrangements should be documented in a formal plan which is available to competent authorities. Consistent with GSR Part 7 [2], the plans and procedures should include, but are not limited to:

Reason: Superfluous

Reason for modification/rejection: Necessary to fully complete the guidance consistent with GSR Part 7.
Paragraph/Line: 2.59 /6
Proposed new text: “The initiating { and the finished }”
Reason: Add, it seems to be more accurate.
Reason for modification/rejection: Covered in GSG-11 and later in this publication
  – Ed Note: (original) 2.59 reads “…Consistent with GSR Part 7 [2], the plans and procedures should include, but are not limited to: … (B) the initiating events that can be envisaged”
IATA-9

• Paragraph/Line: 2.61
• Proposed new text: “Consignors and carriers operating internationally need to consider the national legislation, regulations, and requirements of all States in which they operate. [This is the existing text. I have no proposed solution.]”
• Reason: For air transport it is expected that ICAO Annexes and SARPS should form the basis of consideration. It is completely infeasible for a consignor or air carrier to have information in the national language of every possible State in over which the aircraft may overfly.
• Reason for modification/rejection: The paragraph states “readily understandable”, not “national language”. 
Paragraph/Line: 2.65

Proposed new text: Locate 2.65 after 2.60 (Ed. Note: sentence on first responder training)

Reason: More logical

Reason for modification/rejection: This change would move the sentence out of the section on training and into the section on transnational responses, thus limiting its applicability only to those responses.
• Paragraph/Line: 2.70
• Proposed new text: Delete 2.70 Reason: This is not the major matter to be trained in...
• Reason for modification/rejection: It may not be the major matter, but it is a matter.
  – Ed. Note: (original) 2.70: “All training should include information on implementation and communication within a unified command and control structure”
• **Paragraph/Line:** 2.72
• **Proposed new text:** “Drills are more limited in scope than exercises, and should be developed to maintain the skills of response personnel. …” * Drills are more limited in scope than exercises
• **Reason:** Transfer into a footnote
• **Reason for modification/rejection:** Key to understanding their role in the T/D/E programme.
The exercises should be systematically evaluated, and some of the exercises should even be evaluated by the appropriate regulatory body. Plans and procedures should be subject to review and revision based on exercise evaluation reports.”

Reason: Superfluous. Deleting this part does not change the objective.

Reason for modification/rejection: Key message from GSR Part 7.
• **Paragraph/Line:** 3.11
• **Proposed new text:** “The initial response to an emergency during transport should be primarily based on observable criteria and other indicators.”
• **Reason:** -
• **Reason for modification/rejection:** Inconsistent with GSR Part 7
3.12

Proposed new text: “Carriers who are at a transport accident and first responders arriving at the site area should identify observable conditions which could indicate a radiological or nuclear emergency situation. Any observable indication that a radiological emergency may be present should be acted upon and response procedures should be activated. An emergency class* should be declared if there is a visible loss of containment or shielding integrity, or if a radiation reading taken by a qualified individual with an appropriate radiation instrument confirms that radiation levels are higher than should be expected.” * see GSR Part 7 para 5.14. There are 5 classes of emergencies: “general emergency”, “site area emergency”, “facility emergency”, “alert” or “other nuclear or radiological emergency”

Reason: Clarification

Reason for modification/rejection: First part covered in Section 1. Second part: These are only examples of emergency classes, there is a footnote in GSR Part 7 explaining.
3.13

Proposed new text: “.... Leaking liquids, gases or powders as well as elevated dose rate may indicate that package integrity has been compromised.”

Reason: Elevated dose rate would also be an indicator (special form material)

Reason for modification/rejection: Covered later in Section 3. Do not want to give the impression that dose rate measurements should always be available.
Proposed new text: “Consignors/consignees and carriers should make arrangements so that transport documents can be promptly available to emergency response organizations, on request. [This is the existing text. I have no proposed solution.]”

Reason: This is not in accordance with the current provisions set out in the ICAO Technical Instructions for air transport. The consignor(s) will not be immediately known in the event of an aircraft accident where the aircraft is carrying packages of Class 7. There is provision for basic information to be made available emergency responders without delay. More detailed information can be made available as needed.

Reason for modification/rejection: Agree with the intent but I do not find inconsistency. This is only recommending transport documents.
Emergency workers—First responders, then other emergency response teams needed, should access and review the transport documents, which provide information on the radioactive material and the package(s) being transported and, if available, should be used to determine the number of packages, activities and radionuclides that could be present. The documents provide information which may be used to help determine the extent of the emergency and the expertise needed to respond to the emergency.s..

Reason: Clarification and simplification
Reason for modification/rejection: Gives an impression that the documents should be immediately available in all cases. By saying emergency workers, it allows for some reasonable delays, referencing comment IATA-10 above.
3.21

Proposed new text: “(c) Establish a unified command and control system for emergency response under the allhazards approach as part of the emergency management system. For transport emergencies, this may include the consignor or carrier.”

Reason: superfluous

Reason for modification/rejection: Conceptual link to GSR Part 7 requirement
Additional protective actions may be considered as a result of the loss of containment or deficient shielding of the package(s), including…

Reason: Clarification

Reason for modification/rejection: Uncommon use of “deficient”; already covered by “loss of”
• Paragraph/Line: 3.34
• Proposed new text: Delete 3.34
• Reason: [10] will be applicable so no need to repeat.
• Reason for modification/rejection: Important linkage to [10]
  – Ed note: (original) 3.34: “To minimize the risk of conflicting statements being given to the news media, the responsibility of communicating with news media representatives should be coordinated by a designated individual or organization [10].”
When assessing whether the conditions are stable, the stability of the exposure situation, the consignor, in cooperation with any required technical experts (e.g., package designers), should assess the likely development of the situation in the future (short, medium and long term when relevant). This may include, for example, corrosion of a package’s containment system after it has been submerged for an extended period.

Reason: Clarification

Reason for modification/rejection: Consistency with GSG-11 para 3.7, “...the exposure situation should be well understood and confirmed to be stable...”
Proposed new text: “(c) Criminal investigation activities: There are investigative activities in accordance with national procedures for criminal investigations, which are aimed at obtaining evidence from individuals near the emergency site area who may have witnessed events leading up to, during, or immediately following the emergency.”

Reason: Superfluous

Reason for modification/rejection: Important context
APPENDIX I: FEATURES OF THE TRANSPORT REGULATIONS RELEVANT TO EMERGENCY ARRANGEMENTS

The summary of regulatory requirements listed in Appendix I is not considered necessary. It would be enough to refer to the current edition of the IAEA Transport Regulations (SSR-6). In addition, in case of future changes of the SSR-6 requirements, the Guide would need to be updated. To delete this Appendix would simplify the Guide.

Specific request by SSCs during earlier SPESS steps. Consistent with TS-G-1.2
• **Paragraph/Line:** III.2.
• **Proposed new text:** -
• **Reason:** Having such limitation, quite significant, on the emergencies to be considered is one reason to change the status from appendix to annex…. This is also inconsistent with section 5 of the guide.
• **Reason for modification/rejection:** Since this appendix focuses on initiating events, the limitation is appropriate and does not limit the overall hazard assessment or arrangements.
Comment Resolution

Accepted 185
Rejected 51
Action Requested

Approval to move to SPESS Step 8 for Member State Comments
Thank you!