

**SPESS F**  
**Document Preparation Profile (DPP)**  
**Version 2.1 dated 6 April 2020**

## 1. IDENTIFICATION

**Document Category or set of publications to be revised in a concomitant manner**

**General Safety Guide**

**Working ID:** DS527

**Proposed Title:** **CRITERIA FOR USE IN PREPAREDNESS AND RESPONSE FOR A NUCLEAR OR RADIOLOGICAL EMERGENCY**

**Proposed Action:** **Revision of a publication**

**GSG-2, CRITERIA FOR USE IN PREPAREDNESS AND RESPONSE FOR A NUCLEAR OR RADIOLOGICAL EMERGENCY, 2011**

**Review Committee(s) or Group:** EPRSC, RASSC, WASSC, NSGC

**Technical Officer(s):** Anderson, James

## 2. BACKGROUND

An assessment of experience in Member States has shown that there is a continuing need for consistent guidance on taking protective actions and other response actions<sup>1</sup> during a nuclear or radiological emergency and for placing this guidance in a context that is comprehensive for decision makers and that can be explained to the public. Feedback from Member States on the topic (as well as the existing publication GSG-2) is included in the Appendix to this DPP.

## 3. JUSTIFICATION FOR THE PRODUCTION OF THE DOCUMENT

GSG-2 was published in 2011. Since its publication nearly 10 years ago, key related Safety Requirements have been revised (including GS-R-2 and Safety Series No 115, which were published as GSR Part 7, and GSR Part 3). In the case of GSG-2, some of the guidance and recommendations have been upgraded to requirements in subsequent publications. A summary is below:

GSG-2	Newer material
Table 2: Generic criteria for acute doses for which protective actions and other response actions are expected to be taken under any circumstances to avoid or to minimize severe deterministic effects	GSR Part 7, Table II.1 GSR Part 3, Table IV.1
Table 3: Generic criteria for protective actions and other response actions in emergency exposure situations to reduce the risk of stochastic effects	GSR Part 7, Table II.2
Table 4: Guidance values for restricting exposure of emergency workers	GSR Part 7, Table I.1 GSR Part 3, Table IV.2
Table 6: Tissue specific and radiation specific values of RBE for the development of selected severe deterministic effects	GSR Part 3, definition of RBE (pages 416-417)

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<sup>1</sup> Other response actions are defined in GSR Part 7 as “An emergency response action other than a protective action”. It does not include response measures which are specific to nuclear security.

Other topics, such as the protection strategy and default operational intervention levels have been documented in greater detail in EPR series publications including EPR-NPP PPA 2013, EPR-NPP OILs 2017 and EPR-Protection Strategy (under development) and EPR-RAD OILs (under development). Additional discussions are ongoing within EPRReSC on how best to comprehensively address protection strategy and default operational intervention levels concepts (among others) in safety guides on EPR and in EPR documents.

As such, GSG-2 should be revised to provide greater consistency with other publications<sup>2</sup> and to provide updated guidance and recommendations on criteria for preparedness and response for a nuclear or radiological emergency, including the methodology and implementation of reference level, generic criteria and operational criteria. a, such as observables, emergency action levels and, when appropriate<sup>3</sup>, operational intervention levels (OILs) for initiating the different parts of emergency response and for taking protective actions and other response actions from the generic criteria for facilities and activities in different emergency preparedness categories.

#### **4. OBJECTIVE**

The objective of the document is to present a coherent set of criteria for supporting decision making regarding protective actions and other response actions necessary to meet the goals of emergency response defined in GSR Part 7. The document will include an emphasis on operational criteria including operational intervention levels, emergency actions levels, and observables/indicators.

The target audience is emergency planners and radiation protection officers in operating organizations, response organizations and regulatory bodies with responsibilities to develop and establish criteria for taking protective actions and other response actions, and/or to develop emergency response plans and procedures to implement the criteria.

#### **5. SCOPE**

The scope of the publication will remain the same as GSG-2, including guidance on methodology and how to implement criteria but removing the specific values and definitions which have been upgraded to requirements since the publication of GSG-2, as noted in Section 3 of the DPP. The scope includes criteria for initiating protective actions and other response actions to protect workers, emergency workers, helpers and the public in a nuclear or radiological emergency. The scope includes all facilities and activities, and all emergency preparedness categories as defined in GSR Part 7.

#### **6. PLACE IN THE OVERALL STRUCTURE OF THE RELEVANT SERIES AND INTERFACES WITH EXISTING AND/OR PLANNED PUBLICATIONS**

Within the IAEA Safety Standards Series, this Safety Guide will be part of the General Safety Guides supporting primarily GSR Part 7 as well as Section IV of GSR Part 3 on emergency exposure situations.

This Safety Guide will interface with at least the following IAEA Safety Standards:

1. FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION ORGANIZATION, INTERNATIONAL LABOUR ORGANIZATION, INTERNATIONAL MARITIME ORGANIZATION, INTERPOL, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, PREPARATORY COMMISSION FOR THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY

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<sup>2</sup> Including, as appropriate, safety standards, the nuclear security series, and the EPR series.

<sup>3</sup> In order to avoid duplication with other publications, some guidance on OIL's will be considered for being upgraded to the Safety Guide level, whilst other guidance would remain in the EPR Series, as indicated in Section 7

- ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, UNITED NATIONS OFFICE FOR THE CO-ORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION, WORLD METEOROLOGICAL ORGANIZATION, Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSR Part 7, IAEA, Vienna (2015);
2. EUROPEAN COMMISSION, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, WORLD HEALTH ORGANIZATION, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014);
  3. FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION, Arrangements for Preparedness for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-G-2.1, IAEA, Vienna (2007, under revision).
  4. FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION ORGANIZATION, INTERNATIONAL LABOUR OFFICE, INTERNATIONAL MARITIME ORGANIZATION, INTERPOL, OECD NUCLEAR ENERGY AGENCY, UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION, WORLD METEOROLOGICAL ORGANIZATION, Arrangements for the Termination of a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG 11, IAEA, Vienna (2018).
  5. INTERNATIONAL ATOMIC ENERGY AGENCY, Arrangements for Public Communication in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No GSG 14, IAEA, Vienna (In development).
  6. INTERNATIONAL ATOMIC ENERGY AGENCY, Considerations in the Development of a Protection Strategy for a Nuclear or Radiological Emergency, Emergency Preparedness and Response Series, IAEA, Vienna, (In development).

All relevant sections in the IAEA's Department of Nuclear Safety and Security will be consulted, as appropriate, throughout the drafting and review process. The document will be an interface document, considering the possible impacts of nuclear security response measures on the operational criteria, namely observables and other indicators.

Interest for co-sponsoring this Safety Guide is expected by the relevant international organizations - members of the Inter-agency Committee for Radiological and Nuclear Emergencies (IACRNE) that are already co-sponsoring GSG-2 and GSR Part 7. The interactions with these organizations will be coordinated by the Technical Officer within the framework of IACRNE. GSG-2 is co-sponsored by FAO, ILO, PAHO, and WHO.

## 7. OVERVIEW

The Safety Guide is expected to cover the following contents:

1. Introduction  
*This Section is expected to cover the Background, Objective, including expected outcomes and benefits from its development, Scope and Structure of the Safety Guide*
2. Framework for Emergency Response Criteria  
*This Section is expected to systematically explain the linked concepts of the dosimetric concepts, reference level, generic criteria and operational criteria defined in the Safety Requirements.*
3. Operational Criteria  
*This Section is expected to address the technical basis, calculations, and values for the operational*

*criteria including operational intervention levels, emergency action levels and observables/indicators. As appropriate, concepts from the EPR series may be upgraded into the Safety Guide.*

#### 4. Appendices

*Appendices will address (1) any necessary elaboration of the values for the dosimetric quantities not covered in GSR Part 3 and GSR Part 7, (2) Default operational intervention levels, (3), Development of emergency action levels (EALs) and example EALs, (4) Observables and other indicators at the scene of a nuclear or radiological emergency, and (5) Application of the operational criteria to different emergency scenarios*

## 8. PRODUCTION SCHEDULE

Provisional schedule for preparation of the document, outlining realistic expected dates for each step (*fill the column corresponding to your proposed document and delete the other columns*):

	A*
STEP 1: Preparing a DPP	DONE
STEP 2: Approval of DPP by the Coordination Committee	Q2 2020
STEP 3: Approval of DPP by the relevant review Committees	Q4 2020
STEP 4: Approval of DPP by the CSS	Q2 2021
STEP 5: Preparing the draft Indicate as to whether a TM is expected to be organized for the preparation of the draft	TM in Q4 2021
STEP 6: Approval of draft by the Coordination Committee	Q1 2022
STEP 7: Approval by the relevant review Committees for submission to Member States for comments	Q2 2022
STEP 8: Soliciting comments by Member States	Q2 2022
STEP 9: Addressing comments by Member States	Q4 2022
STEP 10: Approval of the revised draft by the Coordination Committee Review in NSOC-SGDS (Technical Editorial review)	Q1 2023
STEP 11: Approval by the relevant review Committees	Q2 2023
STEP 12: - Submission to the CSS - Submission in parallel and approval by the Publications Committee - MTCD Editing - Endorsement of the edited version by the CSS	Q4 2023
STEP 13: Establishment by the Publications Committee and/or Board of Governors (for SF and SR only))	N/A
STEP 14: Target publication date	Q1 2024

## 9. RESOURCES

Estimated resources involved by the Secretariat (person-weeks) and the Member States (number and type of meetings)

- Secretariat: 60 person-weeks
- For each Member State participating in the writing team:
  - Four 4-day consultancy meetings
  - One 5-day technical meeting
- For other Member States:

- Participation in the technical meeting, if desired
- Participation in review committee meetings, if applicable

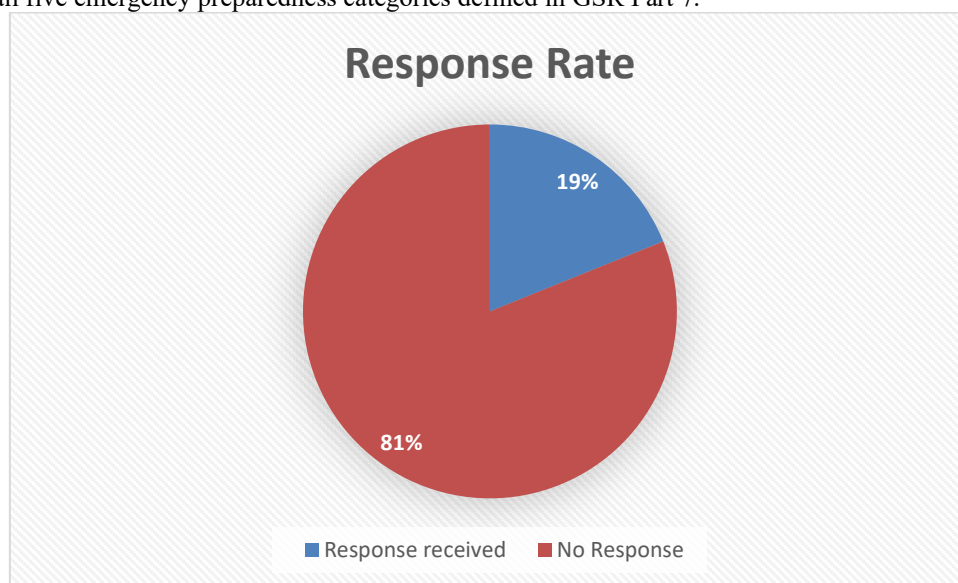
## APPENDIX: FEEDBACK ANALYSIS REPORT

As a result of the decision during EPRESC-8a review questionnaire was submitted to EPRESC members and observers to begin compiling data that will be used for determining the need to revise GSG-2. The aim of the questionnaire was to identify if changes are needed, where changes may be most needed, what additional guidance may be necessary and what improvement, if any, could be made to the scope, content and structure in a revised Safety Guide GSG-2.

This report summarizes the responses to the questionnaire which can be used to determine whether to proceed with the revision of GSG-2.

### A.1. Responses Received

In total, 16 responses have been received. This includes responses from 15 Member States out of 63 EPRESC members/observers and 1 International Organization out of 10. Responses were received from Member States including all five emergency preparedness categories defined in GSR Part 7.



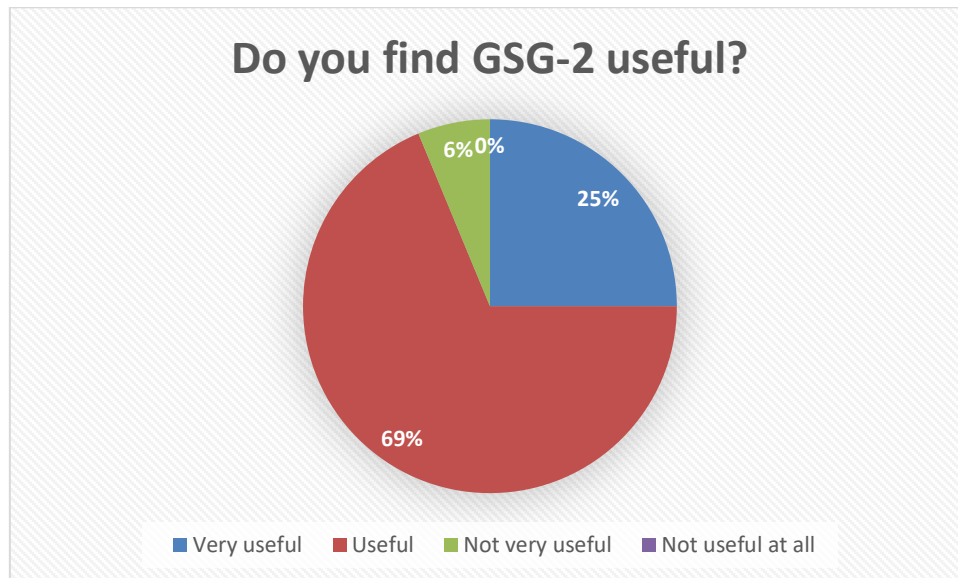
In the first part of the questionnaire the Member States selected the Emergency Preparedness Categories applicable to their countries and filled all the specifics about Member States and International Organization.

### A.2. Summary responses to individual questions

The second part on GSG-2 feedback is structured in nine main questions.

#### A.2.1. Question 1

The first question is about the usefulness of GSG-2. The majority of the countries found it useful (69%).



The most common responses related to the *most* useful sections of GSG-2 were:

- Default Operational Intervention Levels (OILs);
- Generic Criteria for protective actions and operational criteria, the Emergency Actions Levels (EALs), development of EALs and examples of EALs for light water reactors (Appendix III); and
- Guidance values for emergency workers.

Single comments were about the usefulness of dose concepts and dosimetric quantities (Appendix I), and the framework for emergency response criteria (Section III).

The most common responses related to the *least* useful sections of GSG-2 were:

- Relationship between Generic Criteria and Reference Levels;
- Examples of default OILs for deposition, individual contamination and contamination of food, milk and water (Appendix II);
- Framework for emergency response criteria;
- Guidance values for emergency workers, in that the section on protection of workers is not as comprehensive as needed and it could use additional information for different types of workers in various phases of the emergency; and
- Operational criteria (Section 5) in that the advice regarding doses criteria is considered either too specific or too general and there should be more flexibility.

Additionally, there were individual comments regarding the following topics: the discussion of basic concepts such as dose, substantial risk as a basis for operational criteria as it is not implementable, Observables on the scene of a radiological emergency (Appendix IV), Calculations of Dose concepts and dosimetric quantities (Appendix I) as least useful parts. Another comment was about the description of the 'Observables' under basic considerations and Development of EALs and examples of EALs for light water reactors (Appendix III), that are not very descriptive.

#### **A.2.2. Question 2**

Concerning the question about what guidance from GSG-2 the country implemented, the majority of comments received were on:

- Framework for emergency response criteria (Section 3), Guidance values for emergency workers (Section 4), Operational criteria (Section 5);
- Explanations for the use of emergency action levels (EALs) for emergency classification;
- OILs (the immediate evacuation OIL 1, temporary relocation and stop consumption of local produce OILs 2, 3, skin decontamination 4, values for food and water);
- Guidance for implementing the protection strategy (Links between protection strategy and generic criteria), generic criteria for urgent protective actions and other response actions in emergency exposure situations; and
- System of protective actions and other response actions in an emergency (Table 1), Generic criteria for acute doses for which protective actions and other response actions are expected to be taken under any

circumstances to avoid or to minimize severe deterministic effects (Table 2), Generic criteria for protective actions and other response actions in emergency exposure situations to reduce the risk of stochastic effects (Table 3), Dose concepts and dosimetric quantities (Appendix I).

Additional comments received were on observables and several decision flow-charts in national guidance, System of generic criteria, Individual Contamination and Contamination of Food, Milk and Water, Use of operational intervention levels within the protection strategy. The implementation of the emergency plan, communication established between the classes IAEA, the type of accidents and the reference situations of the National Plan used in Emergency Plans, use operational criteria and appendix III were part of the comments.

### **A.2.3. Question 3**

The third question is about what guidance from GSG-2, if any, their country did not implement because it was too difficult to follow. The majority of the comments were related to:

- OILs (1 and 2 values for defining alpha and beta surface contamination measurement, OIL 4 value for defining alpha, operational intervention level, skin decontamination). It should be done a clear connection between OILs and generic criteria they are based on; and
- EALs is difficult in regulation and EPR system for non-nuclear countries, deciding on EALs for non-nuclear practices is too difficult.

Individual comments mentioned Observables/Indicators for nuclear or radiological emergencies as difficult to implement for countries that don't have Emergency Preparedness Category I facilities, Emergency classification for light water reactors in operating, standby or hot shutdown mode (Tables 12) and Emergency classification for light water reactors in cold shutdown or refuelling mode (Table 13) are difficult to implement as not relevant for some countries, Guidance for use of "Substantial risk as a basis for operational criteria" and developing protection strategy. Another comment included Plain language explanation, lack of human resources to deal with all the changes and updates from both EU and IAEA, Generic Criteria for acute doses.

### **A.2.4. Question 4**

The fourth question is about feedback from the implementation of GSG-2. Majority of comments were about OILs, it is suggested to:

- Distinguish nuclear emergency and radiological emergency for the application of some on the OILs, because some of them cannot be usable for nuclear emergency but might be useful for radiological emergency;
- Implement OILs at the national level, to regulate the activities and measures to protect the public and the environment in the event of a nuclear or radiation emergency;
- GSG-2 provides very clear-cut criteria for deciding and implementing protective actions and provides also a plain language explanation of OILs for easy understanding by decision makers and the public; and
- Request for more information or additional, practical guidance for derivation of OIL values.

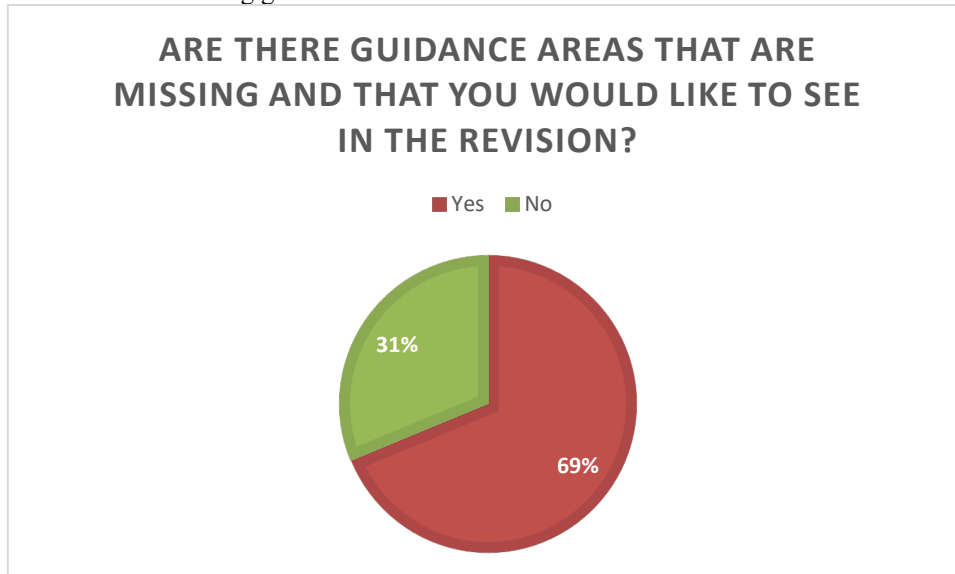
Individual comments were on the following topics:

- Guidance from GSG-2, which is in the process to be implemented, feedback might be expected once the new EPR arrangements are in place;
- GSG-2 that was used in the development of its "Generic Criteria and Operational Intervention Levels for Nuclear Emergency Planning and Response";
- System of generic criteria and operational intervention levels for the off-site decision taking during nuclear power plant emergencies, that was implemented and tested in a country national plan. Positive feedback from the off-site decision takers, easier to justify the protective actions and to convince the public about these actions;
- Request to IAEA guides to inform/inspire the process of harmonization of reference levels and emergency response; and
- Expansion of GSG-2 to serve on more types of reactor and guide the nuclear emergency, classification of the emergency according to facilities categories, and proposal for the possibility for PAZ and UPZ minimization for relevant type of facilities.

### **A.2.5. Question 5**



The fifth question is about missing guidance areas that Member States would like to see in the revision.

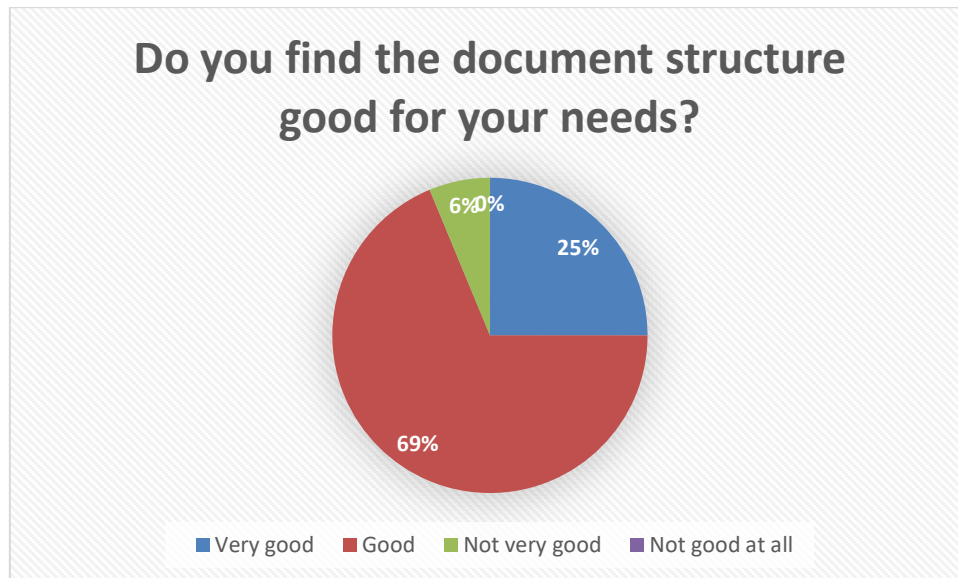


Guidance areas have been proposed on these topics:

- Further guidance on response to a radiological emergency;
- Plain language guidance discussing the use of Optimization;
- Guidance for determining the size of emergency planning zones/distances applicable for different facilities in EP category I and II;
- Dose limits and criteria for emergency workers;
- Additional guide on how to adjust OILs and GALs to the new, reference level-based protection strategy, better definition on EALs non-nuclear practices;
- guidance on Operational Criteria for restricting the use of vehicles, equipment and other items in GSG-2, guidance about operational criteria for managing the radioactive waste generated during nuclear or radiological emergency;
- some generic and operational criteria in the Safety Guide No. GSG-2;
- The document should deal with criteria, for example whether to classify wet spent fuel storage as Emergency Preparedness Category II or III. Adding criteria for deciding on extent of emergency planning zones; and
- Practical Guidance on derivation of OILs and additional information on Observables and EALs for information purposes.

#### **A.2.6. Question 6**

The sixth question is about the document structure, if it is good for countries' needs.



#### A.2.7. Question 7

The seventh question is about what areas of GSG-2 which could be covered in other safety guides to be developed. We have received comments on:

- Protection of workers, including EPR Medical, EPR First Responders (EPR Series Documents), EPR Series Document on OILs for Radiological Emergencies. General Safety Guide on Emergency Workers and Helpers is supported, Specific Safety Guide for different Emergency Planning Categories should include information on applying the Graded Approach.
- Guidance for determining the size of emergency planning zones/distances applicable for different facilities in EP category I and II based on the hazards resulting from operation of these facilities, proposing methodology of dose projections (including RBE-weighted absorbed dose (generic criteria) for determining PAZ size as well as criteria for selecting appropriate reactor and weather conditions).
- The “Guidance values for emergency workers” part can be elaborated in the DS504 “Arrangements for Preparedness and Response for a Nuclear or Radiological Emergency (Revision of GS-G-2.1) document by giving detailed information about the arrangements for the radiation protection of the emergency workers. The “Appendix 3- Development of EALs and Examples of EALs for light water reactors” part of GSG-2 can be elaborated in the “EPR NPP Assessment Revision of TECDOC-955, Generic Assessment Procedures for Determining Protective Actions during a Reactor Accident” document considering the different reactor types and conditions in the reactors.
- Develop a common framework for the dose criteria and standards into the recovery phase, both for the emergency workers and for the personnel who will operate the nuclear facilities after an accident. Proposal of single document for better alignment between GSG 2.1 and GSG 2 with a clearer purpose for each document which in turn may allow for more consistency and elimination of duplication of information
- To describe all existing generic and operational criteria with the link to practical use.
- “EPR-NPP-OIL 2017” is for reactors, but the other type of nuclear facilities also needs to be considered, such as reprocessing plant. It is necessary to provide the methodology for type of facilities to make their own OILs.
- Updating GSG 2 to be more aligned to the latest EPR guidance documents such as GSG 11 etc. to outline the stages of a nuclear or radiological emergency exposure situation and when the EAL’s, OILs and observables should be implemented.

#### A.2.8. Question 8

The eight question is about the most important change proposed in GSG-2. Comments were on the following topics:

- the document should stay as an overarching document that establishes the GC and the reason why and justifications for those levels, duplication between GSG-2 and other IAEA publications should be

reduced, it is suggested to add the 50 mSv described in Guidance values for restricting exposure of emergency workers (Table 4)

- more detailed information in Observables on the scene of a radiological emergency (Appendix 4), considering lessons learned from the past radiological emergencies
- adding details about cross-border coordination
- Consistency with other safety standards such as GSR Part 7 and GS-G-2.1 (DS504). Revised GSG-2 should include some parts of these developments and be consistent with these EPR series documents
- Removal of appendix III “Development of EALs And Examples of EALs for Light Water Reactors” since it is covered in separate publication and specific for LWR operators (yet it constitutes over 1/3 of the GSG-2).
- 4 classes of emergency (GE, SE, FE, Alert) are defined, but in the examples (p 61->80), only three of them, GE, SE and Alert are used. In Development of eals and examples
- of EALs for light water reactors (Appendix III) it is not possible for the EALs to cover “all possible events” and to ensure “all severe accidents are addressed” because there are an infinity of possibilities and some assumptions are used in the studies. It’s suggested the term “type of events” as more appropriate.
- This guide is very specific in nature and focused for providing guidance on criteria for use in preparedness and response for a nuclear or radiological emergency. No area of this guide can be covered in other safety guides to be developed under the road map.
- Further guidance on the derivation of OILs
- Considering the climate differences, the typical meteorology condition used in OIL defaults should be reconsidered and include the effect of precipitation. A new method to derive OIL with wet deposition, a new method of liquid dispersion and OIL that could be used in offshore measurements. The radius of PAZ and UPZ can be proposed by the power level and type of facilities, and the divide of the power level should be considered more detailed in the low power level range.

### A.2.9. Question 9

The last question was about other suggestion that could improve GSG-2. Suggestions received were on:

- clearly define the scope of two Safety Guides, discuss how to deal with the OIL7 and OIL8 given by the EPR-NPP-OILs (2017), which are not included in GSG-2 (2011). Explanations for the both OIL7 and OIL8 should be included in the new version
- The GSG-2 needs to be amended following the change in GSR part 7 which it supplements
- OILs values need to remain unchanged, but GSG-2 OILs need to be aligned with the OILs included in the document Actions to Protect the Public in an Emergency due to Severe Conditions at a Light Water Reactor.
- add specific guidance about the protection strategy
- developing reference levels and the connection to dose criteria, emphasizing the importance of developing strategies in emergency response planning to facilitate optimization during emergency response, elaborating on the effectiveness as well as the positive and negative consequences of protective actions. Elaborating on the use of the representative person in emergency response planning, emphasizing that harmonization in applying the same process is more important than using the same generic criteria for protective actions. The voluntary basis for response actions by emergency workers should be connected to the dose limit for radiation workers and not a specific numerical value.
- As the development of SMR technology, it is necessary to review the source term that applied in OIL defaults combining as much as the reactor types. The hypothesis of OIL default should be reconsidered to include regional variety such as exposure time, production of farm and pasture and deposition fraction into pasture and agriculture products. The consistency of OIL defaults should be re-examined. The OILs for radiological accidents should be considered in case that the consequence of such accident could be effectively controlled. During revision of GSG-2, the experience gained from the response to the accident at the Fukushima Daiichi nuclear power plant should be considered. It is also necessary to provide the EALs models for the nuclear fuel cycle facilities.

### A.3. Conclusion

The responses to the questionnaire indicate a consensus on the need to revise GSG-2 with the objectives to better align it with GSR Part 7 and other safety standards, reduce redundancy with other documents published since GSG-2, and align it with the initiatives to be undertaken in line with the EPRESC Road Map for the development and revision of safety standards in emergency preparedness and response.