Waste Safety Standards Committee

38th Meeting

24-25 November 2014

Agenda Item W7.3


Monika Kinker, WES/NSRW
Background (2010)

- Revision of Safety Guides (pub. 2003) on the Predisposal Management of:
  - High Level Radioactive Waste (RW), WS-G-2.5
  - Low & Intermediate Level RW, WS-G-2.6
- **Roadmap** for Long Term Structure of Standards:
  - Integration of Thematic Safety Standards into General, Facility/Activity–specific Standards
- **Need** for holistic plan considering interdependences, optimization in the generation, management (including disposal) of RW
  - Facility-specific guides that cover lifetime of the facility
  - Including, wherever possible, additional topics as part of revision of existing SGs, rather than by new SGs
# WSS on Predisposal Management of Radioactive Waste

## IAEA Safety Standards

### Fundamental Safety Principles

- **No. SF-1**
  - 2006

### Predisposal Management of Radioactive Waste

- **No. GSR Part 5**
  - 2009

### Storage of Radioactive Waste

- **Safety Guide No. GS-G-6.1**
  - 2003

### Management of Waste from the Use of Radioactive Material in Medicine, Industry, Agriculture, Research and Education

- **Safety Guide No. WS-G-2.7**
  - 2006

### The Safety Case and Safety Assessment for the Predisposal Management of Radioactive Waste

- **General Safety Guide No. GS-G-3**
  - 2013

### The Management System for the Processing, Handling and Storage of Radioactive Waste

- **Safety Guide No. GS-G-3.3**
  - 2008

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**General Safety Guide No. GSG-1**

- **2009**

**Safety Guide No. GS-G-6.1**

- **2003**

**Safety Guide No. WS-G-2.7**

- **2006**

**Safety Guide No. GS-G-3**

- **2013**

**Safety Guide No. GS-G-3.3**

- **2008**
Safety Guides: Facility-, Activity-Specific

- Storage
- “Small Generators”
- SnF

- IAEA Safety Standards for Facility- and Activity-Specific Safety Guides

- Safety Guide No. WS-G-6.1
- Safety Guide No. WS-G-2.7
- Safety Guide No. WS-G-6.1

Flowchart of the treatment of radioactive gases, liquids and solid waste

- NPPs
- RRs
- Centralized RWM Facilities
- U/MOX Fuel Fabrication
- Reprocessing Plants
- Vitrification Plants
- DS447 – Mgmt of RW from Reactors
- DS448 – Mgmt of RW from FCFs

- Storage of Spent Nuclear Fuel: DS 371

Source: U.S. Nuclear Regulatory Commission
WSS and related SSs for Predisposal Management at Nuclear Fuel Cycle facilities (NFCF)
**Objective:** Provide operators, regulators & government bodies with recommendations on predisposal management of RW at NFCFs, including centralized facilities, taking into consideration of general safety matters applicable to all facilities, including need for holistic and optimized RWM programmes

**Scope:**
- Predisposal management of RW at NFCFs, from generation to (but not including) disposal
- Uranium conversion (natural, irradiated), uranium enrichment (centrifuge), uranium/mixed oxide fuel fabrication, SF reprocessing, centralized RWM facilities
- All steps (generation, pretreatment, treatment, conditioning, storage, transport)
- All facility lifecycle phases (siting, design, construction, commissioning, operation, shutdown, and decommissioning
1. Introduction
2. Protection of Human Health & Environment
3. Roles & Responsibilities
4. Integrated Approach to Safety
5. Safety Case & Safety Assessment
6. General Safety Considerations

Appendices
1. Development of Specifications for Waste Packages
2. Facility-Specific RWM Programme
3. Examples of Key Planning Activities Relevant to the Lifetime of a Predisposal RWM Facility
4. Examples of Hazards at RWM Activities At FCFs
5. Examples of Hazards at Centralized RWM Facilities
6. Safety Considerations for RWM At FCFs
7. Flow Diagram for Solid RWM
Preparation

- DPP Approved by October 2010 CSS
- 2011 – 2013 document under development
- 3Q 2013 approved by SSCs for submittal to MS (comments due Dec 2013)
- Consultancies held in June, July 2013
  - Experts from Canada, Germany, South Africa, United Kingdom, USA
  - Focus on General vs Facility–specific Safety Provisions
- Posted for Committee Comments (NSGC, WASSC, RASSC, NUSSC)
  - 145 SSC comments
  - 366 MS comments
363 Comments from 16 MS, 1 IO

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## Resolution of MS Comments

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- **49%** Accepted
- **39%** Accepted w modification
- **12%** Rejected
Resolution of MS Comments: General

• General Comment (Ger, UK):
  • DS447 and DS448 should be merged into a single Safety Guide.
  • If IAEA chooses to retain 2 separate guides, a check for consistency and completeness between DS447 and DS448 is needed.

• Resolution:
  • SG developed in response to requests from MSs to have a self-standing publication that addresses the different communities of users separately and expands on the documents with facility specific details. In this regard, it also includes requirements on “general” safety matters with facility-specific details
3.22 The operating organization is responsible for the safety of all activities associated with the management of RW (including activities undertaken by contractors) in compliance with the principles contained in [1], and for the identification and implementation of the programmes and procedures necessary to ensure safety."

Comment: The operating organization … **cannot ensure safety of 3rd party enterprise**, in particular, if it is located abroad.

Response: The operating organization is ultimately responsible for the safety of all activities associated with the management of RW iaw national legal/ regulatory framework, international requirements, and requirements of the license. If waste is transferred to another licence holder, transfer agreements need to be in place (ownership)
Resolution of MS Comments: Responsibilities

Proposal

• “The operating organization is responsible for the safety of all activities associated with the management of radioactive waste at its facilities (including activities undertaken by contractors) ... ”

• “In some instances the operating organization may be the owner of the RW and in other cases the owner may be a separate organization or operating unit. In the latter case, the interface between responsibilities of the owner and the operating organization should be clearly defined, agreed and documented. Ownership of the RW should always be clearly identified. Information about changes in ownership of the RW or changes in the relationship between the owner and the operating organization of the predisposal RWM facility should be provided to the RB and, where required, to government institutions.”
Resolution of MS Comments: Waste Classification (Para’s 3.10, 6.06)

3.11 In order to facilitate the establishment of a national policy and strategy, the Government should establish a national inventory of RW … and update it at regular time intervals. This inventory should take into account the guidance in GSG-1 [9].

Comment: Completeness to consider that certain States may have different waste classification system than GSG-1

Response: GSG-1 give guidance on the objectives, methods and approaches to the classification of RW; the classification scheme is based on the long term management (disposal) of RW

Proposal: “the Government should establish a national inventory of the RW … This inventory should address the various waste classes as identified in GSG-1 [8] or in the national waste classification scheme, taking into account their long term management including disposal...”
Resolution of MS Comments: Mixing or Blending of Waste

“Characterization and Classification of Waste

6.15 The categorization and classification of RW assists in the development of management strategies and in the operational management of the waste… Documented procedures should be followed for the characterization of RW and its segregation, and for assigning the waste to a particular class. Mixing or blending of waste at its waste stream generation may be allowed by regulatory authorities in order to enhance and facilitate waste disposal.”

Comment: Completeness to consider that certain States may have different waste classification system than GSG-1

Response:

• (GSR Part 5, Req 8) RW arisings shall be kept to the minimum practicable. Measures to control the generation of RW, in terms of both volume and radioactivity content, have to be considered…
Resolution of MS Comments: Mixing or Blending of Waste Proposal

“(Pretreatment)

6.21 Mixing of waste (e.g., concentration averaging) at the generating source may be allowed by certain State regulatory authorities in order to achieve specific waste acceptance requirements. Mixing waste streams should be limited to those streams that are radiologically and chemically compatible. If the mixing of chemically different waste streams is considered, an evaluation should be made of the chemical reactions that could occur, especially any exothermic reactions in order to avoid uncontrolled or unexpected reactions that could cause the unplanned release of volatile radionuclides or radioactive aerosols.”
“Siting and Design

6.70 The design and operation of a facility for predisposal radioactive waste management should be carried out in such a way as to ensure subcriticality in both operational states (i.e. normal operation and anticipated operational occurrences) and under accident conditions (i.e. design basis accidents) by means of ...

6.71 1st sentence: “... maintaining the temperature of the waste within acceptable limits..., both in operational states (i.e. e.g. normal operation and anticipated operational occurrences) and under accident conditions (i.e. e.g. design basis accidents and design extension conditions).”
Resolution of MS Comments: Design Extension Condition

Comment:

• In order to maintain consistency with SSG-27 “Criticality Safety in the Handling of Fissile Material”, it is necessary to specify the plant states for which the statement in Para 6.70 is applicable. According to SSG-27, the criticality safety assessment should demonstrate that subcriticality will be maintained in normal operation, for anticipated operational occurrences and for DBAS (or the equivalent).

• In our opinion, this topic needs further discussion in WASSC and NUSSC, considering that the term ‘DEC’ has not yet been defined for predisposal RWM facilities and NFCFs.
Resolution of MS Comments: Design Extension Condition

SSR-2/1 (Rev. 1): Design Extension Condition

Accident conditions that are not considered for design basis accidents, but that are considered in the design process of the facility in accordance with best estimate methodology, and for which releases of radioactive material are kept within acceptable limits. DECs could include severe accident conditions.

RESPONSE

- Currently, the DEC concept is only established for NPPs in SSR-2/1; not in GSR Part 5 nor in NS-R-5, i.e. the overarching requirements relevant for DS447.
- NS-R-5 currently under revision (NUSSC leading committee).
- SSG-15 currently under revision (DS489).

The changes proposed are sufficient for DS447.
Accidents beyond the design basis are those that are not considered for 
DBAs, but that are considered in the design process of the plant in accordance 
with best estimate methodology, and for which releases of radioactive material are 
kept within acceptable limits [Safety Glossary]. Design extension conditions may 
be considered in two general groups:

(a) Those that have a high enough probability of occurrence and severe enough 
consequences that it is advisable to give some prior consideration to possible 
corrective or remedial actions that could be taken if such an event were to occur. 
This may be appropriate even though the probability of occurrence is lower than 
that of design basis accidents.

(b) Those that have a low enough probability of occurrence not to warrant such 
consideration, even though the potential consequences could be severe.

The distinction between design basis accidents and accidents beyond design 
basis is based upon consideration of the probabilities of occurrence and the 
consequences.
## Comments from NSGC, WASSC, NUSSC, RASSC

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1 Comment received from 1 MS (France)

1 General comment on DS447 and DS448:

• Req’s 5, 21 of GSR Part 5 are in fact security recommendations. In consistency with the IAEA definitions of the NSS and SS they belong to the Nuclear Security Series instead of the SSs

  no change proposed: relay to WASSC

→ NGSC Approved

...Request to add Ref. to Nuc Sec Fundamentals accepted
Resolution of Comments: WASSC/NUSSC/RASSC

General Comments

• To avoid some repetitions, specific recommendations related to waste that have no disposal available may be regrouped in a specific chapter SSs **need further detail**

• A new type of NFCFs, encapsulation plants for SNF will be constructed and be in use in the future. In general, requirements and recommendations given e.g. in this guide can be applied for them. However, a possible need for additions or changes should be examined. **need further detail**

• There is no need to separate DS448 and 447. Especially with the concept of graded approach. **no change proposed**
Resolution of Comments: WASSC/NUSSC/RASSC

Specific Comments

• Delete App 7 (Management Flow diagram for solid RW) This flow diagram deems (sp.) confused. For example;
  • The 3rd step shows not actions/process but only items regarding predisposal management.
  • “Clearance” is duplicated and “Clearance” at the end of the flow is deemed “removal from regulation.”
  • Incinerated ash is immobilize with cementitious material but compaction is not applied to this waste.

*Diagram placed by request of MS; specific corrections made*
App. 7: Management Flow Diagram for Solid RW

Waste Generation

Pretreatment: collection, segregation, chemical adjustment, decontamination

Clearance

Storage for decay

Are clearance levels met?

No

Yes

Immobilization of residues and filters

Compaction

In-drum Compaction

Drum Compaction

Conditioning in an overpack

Conditioning and Packaging

Storage of conditioned waste

Disposal Facility

Incineration

Cementation

Conditioning in an overpack

Conditioning and Packaging

Storage of conditioned waste

Disposal Facility

Treatment of combustible waste

Treatment of non-combustible waste

Treatment of compactible waste

Treatment of non-compactible waste

Are clearance levels met?

No

Modified

original

Clearance

Removal from control

Storage for decay

Original

Modified
• DS447, DS448 should refer to one another
• Waste acceptance criteria vs. waste acceptance requirements:
  • GSR Part 5 refers to ‘waste acceptance criteria’
  • avoid confusion w other types of requirements
• Review with relevant Secretariat to ensure consistency w SS’s under development or that have been since approved
  • Decommissioning (para. 3.9, 3.24-3.26, 6.102-6.105) against GSR Part 6
  • Doses and radiation protection (para. 2.5-2.9, 6.100) against GSR Part 3
  • Discharges (para. 6.40-6.48, 6.81-6.82) against DS442 (rev. to WS-G-2.3)
• Outstanding small editorial issues fixed during pub.
Next Step

- SG for clearance for submission to Commission on Safety Standards for approval for publication