Waste Safety Standards Committee
37th Meeting
23-27 June 2014

Agenda Item: W 11.1
DS427: Assessment of Facilities and Activities for Protection of the Public and Protection of the Environment
(original title: Radiological Environmental Impact Assessment for Facilities and Activities)

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Waste and Environmental Safety Section/ NSRW
Background (1/3)

- DPP was approved in 2009 by CSS.
- Delays occurred due to development of BSS (2011) and ICRP recommendations (2009-2013).
- Draft developed by series of consultancies and a Technical Meeting.
- First full version of DS427 was uploaded to SSCs web page in Nov. 2013 and received comments.
Background (2/3)

• DS427 was discussed by NUSSC, RASSC and WASSC during last sessions (Nov 2013):
  • NUSSC questioned the treatment/inclusion of ‘potential exposures’ and leave the decision to WASSC (lead).
  • RASSC/WASSC discussed the consideration of ‘flora and fauna’ and ‘potential exposures, and instructed the Secretariat to prepare a new version to be discussed during current SSCs sessions.
The Secretariat considered:

- received comments,
- discussions during last SSCs sessions,
- discussions within the Secretariat (NSRW, NSNI, SSC Scientific Secretaries, SS Coordination Section, consultants),

and produced a new version.

In April 2014 the new version was uploaded to the web and received comments.
DS 427 presents an assessment scheme for normal operations that uses a similar approach for humans and for the environment, both based on ICRP recommendations.

While protection of the environment is a relatively new topic, considerable work has already been undertaken both by the ICRP, by several MS and by the Agency and a number of publications exist.

The assessment and control of potential exposures is a controversial issue in many MS and there is no international consensus on how to proceed.
• It is intended that the safety guide should address how the evaluation should be undertaken but the selection of specific accident scenarios to be considered and the correspondent criteria would be left to individual MS to decide.

• The need of this guidance for nuclear power embarking countries was noted during discussions.

• RASSC and WASSC considered that the document was ambitious but that it was appropriate for the Agency to develop guidance in this area; if not, due to the interest in environmental protection and nuclear accident issues, such guidance would be developed by others.
• RASSC and WASSC noted the recommendation of NUSSC that potential exposures not be addressed. However, the two Committees considered they needed additional information before being able to support or reject that position.
• RASSC and WASSC therefore asked the Secretariat to continue development of the safety guide and to include material on potential exposures.
• A final decision would be made at the next meeting (e.g. this meeting) on whether the text on potential exposures should be retained or removed.
Objective of this presentation

- To provide WASSC (before RASSC and later NUSSC) with information on the new version of DS427 with emphasis on the most questioned issues:
  - the treatment of ‘potential exposures’, and,
  - the consideration of ‘flora and fauna’,
- To discuss some topical issues raised in comments,

with the aim of facilitate decision / advice on the further development of the document
Objective of DS427

- To provides recommendations and guidance on a general framework for performing assessments of facilities and activities to estimate and control radiological effects on public and on the environment.

- The assessment is intended for planned exposure situations as part of governmental decision-making and the regulatory authorization processes for facilities and activities.
Main changes in the new version

• Tittle changed.
• Flora and fauna is now fully separated as an optional choice by national regulators and only a generic practical proposal, based on ICRP, is presented.
• More options for the selection of accidents to be included for consideration of potential exposures were added.
• Most comments to first version were taken on board.
## Comments received to last version of DS427

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### Comments to DS427 Ver. April 2014

- **Total Comments:** 267
- **Supportive:** 54%
- **Critical (needing SSC advice):** 37%
- **Technical doable by Secretariat:** 2%
- **Editorial:** 1%
- **Informative/clarification comment:** 1%

Let’s focus on those needing SSCs advice.
Should we use the new title?

• From
  • Radiological environmental impact assessment (REIA) of facilities and activities

• to
  • Assessment of facilities and activities for protection of the public and protection of the environment.
Should we use the new title?

- This safety guide was conceived for a broad audience (operators, regulators, other non-nuclear/radiological governmental agencies and ministries, public, etc.).
- REIA was noted as a confusing acronym (because EIA, a different thing, is a well established acronym used in the Safety Guide and elsewhere).
- Communication was identified by the SSCs as an important issue.
- Someone says: “we talk about safety, and you talk about impact...it is misleading”
Should we use the new title?

- The new title was conceived in order to move away from the idea of “assessment of (the level of) impact” to “assessment of (the level of) protection”.
- The change was relatively an easy editorial work and makes full sense in the text.
- The new title is more in line with the related Safety Guide DS 432: Radiation Protection of the Public and the Environment.
Should we use the new title?

- DS427: Assessment of Facilities and Activities for Protection of the Public and Protection of the Environment

**Please Advice:**

*Yes/No/Other*

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Should we include explicit assessment of radiological impact to flora and fauna?

• Up to now, we use humans for the assessment and control of radiological impact to the environment and we assume flora and fauna and other elements in the environment (soils, water, resources) are implicitly protected.

• This assumption, while valid, has been challenged since the 90’s and particularly since the 2003 Stockholm International Conference on Protection of the Environment (IAEA, UNSCEAR, IUR, EC, Member States).

• Meanwhile, ICRP developed an assessment process for flora and fauna compatible with that for humans and the IAEA include protection of the environment in the Standards.
ICRP approaches for humans and flora and fauna protection

Objects of protection:
- Large plant
- Small plant
- Insect
- Annelid
- Large mammal
- Small mammal
- Aquatic Bird
- Amphibian
- Fish
- Seaweed
- Crustacean
- Fish

Assessment reference:
- Reference Person
- Deer
- Rat
- Bee
- Earthworm
- Duck
- Frog
- Trout
- Marine Flatfish
- Crab
- Pine Tree
- Grass
- Seaweed

Estimation of Radiation dose:
- Source
- Exposure pathways
- Environmental transfer / activity concentration
- Dosimetric models

Large plant, Small plant, Insect, Annelid, Large mammal, Small mammal, Aquatic Bird, Amphibian, Fish, Seaweed, Crustacean, Fish
ICRP approaches for humans and environmental protection

Exposure conditions (location and habit data) representative of those most highly exposed  →  Effective Dose to Representative Person  Vs.  Radiological Criteria
(based on data of radiation effects: Dose Limit, Constraints, Reference levels)

Exposure conditions (location, occupation factors) representative of those most highly exposed  →  Absorbed Dose Rates to Representative Organisms (RAPs or equivalents)  Vs.  Radiological Criteria
(based on data of radiation effects: DCRLs)
ICRP RAPs and Derived Reference Consideration Levels for major ecosystems

- Terrestrial Ecosystem: Deer, Rat, Pine tree, Grass, Bee, Earthworm, Large plant, Small plant, Insect, Annelid, Large mammal, Small mammal, Aquatic Bird, Amphibian, Fish
- Freshwater Ecosystem: Frog, Trout, Flatfish, Seaweed, Crab, Duck
- Marine Ecosystem: Seaweed, Crustacean, Fish
Use of RAPs and DRCLs

A more informed decision
ICRP basis for the approach proposed by IAEA

Other approaches consistent with ICRP


- EC EURATOM, 2004 ERICA Project. *Integrated approach to the assessment and management of environmental risks from ionizing contaminants.*

- Canada SCC, 2012 *Environmental risk assessments at class I nuclear facilities and uranium mines and mills*, CSA N288.6.
Opinion by International Organizations

- 2013 Meeting of the IAEA Coordination Group on Protection of the Environment (based on BOG Action Plan 2005)
  - The meeting considered that the approach to address radiological protection of the environment developed by the ICRP [...] is conceptually and scientifically sound enough to be adopted into international radiation safety guidance for those circumstances when a more explicit consideration of the protection of non-human biota is considered necessary.
  - The ICRP approach was considered to be particularly straightforward with respect to the practical guidance necessary for the assessment and control of the radiological impact related to planned releases to the environment, as a complement to the approach typically used for human radiological protection.

UNEP, UNSCEAR, EC, OECD-NEA, IAEA, WNA (Obs.)
Applications of ICRP approach: The 1972 London (dumping) Convention for Protection of Marine Environment


- Opinion by experts designated by the London Convention:
  - *The method developed by IAEA is technically sound and robust. The addition of flora and fauna has not altered the complexity of and the efforts needed to apply the approach.*
Tools for conducting assessments

- EC. ERICA Tool (code)
- US DOE – ANL. RESRAD-BIOTA (code)
Increment of activity concentrations in the environmental media [Bq/kg]

1 mSv $\rightarrow \sum C_{\text{air/water/soil}}$

0.3-0.1 mSv
Should we include explicit assessment of radiological impact to flora and fauna?

Please Advice:
Yes/No/Other

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Should we include the assessment of potential exposures to public in this Safety Guide?

- Is it a BSS topic?
- Is it necessary when you consider planned exposure situations?
- Is it related to emergency preparedness and response?
- Is it a Nuclear Safety or a Radiation Protection issue?
- Should we move to other Safety Guide?
Is it a BSS topic?

- SS-115, BSS 2006
  - The Standards (BSS) apply to both normal and potential exposures.
  - Requirement to estimate probability and magnitude of potential exposures to the extent reasonable and practicable (under Verification of Safety in BSS 1996)
  - Detailed requirements for potential in Appendix IV:
    - requirement to include potential exposures in the Safety Assessments.
Is it a BSS topic?

• GSR Part 3 2011 (new BSS)
  
  • Potential exposure is clearly defined in new BSS
    
    • A prospective exposure that is not expected to be delivered with certainty but that may result from an anticipated operational occurrence, accident at a source or owing to an event or sequence of events of a probabilistic nature, including equipment failures and operating errors.
Is it a BSS topic?

• GSR Part 3 2011:
  • The need to consider “the likelihood and magnitude of potential exposures” is in Requirements 7 and 9.
  • The need to constraint the risk is in the new BSS is in Requirement 11
  • The need to include potential exposures in safety assessment is in the new BSS is in Requirement 12
Is potential exposure a necessary topic when you considered planned exposure situations?

- Planned exposure situations is defined in new BSS:
  - A planned exposure situation is a situation of exposure that arises from the planned operation of a source or from a planned activity that results in an exposure from a source.
  - Since provision for protection and safety can be made before embarking on the activity concerned, the associated exposures and their likelihood of occurrence can be restricted from the outset.
  - In planned exposure situations, exposure at some level can be expected to occur. If exposure is not expected to occur with certainty, but could result from an accident or from an event or a sequence of events that may occur but is not certain to occur, this is referred to as ‘potential exposure’.
Is it related to emergency preparedness and response?

- The prospective assessment of potential exposures (a risk using possible accidents with their probabilities) is not the same as the assessment of the consequences resulting from an actual accident or the assessment of possible accidents for emergency preparedness and response (an identified hazard considered deterministically).
- If a facility or activity meets the criteria for potential exposures, it does not preclude the need for an assessment of hazards in relation to preparedness and response for a nuclear or radiological emergency (in line with other IAEA requirements: GRS Part 7).
- The prospective assessment of potential exposures could provide preliminary information to be used in assessing the hazards and the related consequences for the purpose of establishing adequate level of emergency preparedness and response.

Text agreed with IEC
Is it Nuclear Safety or Radiation Protection?

• The assessment of potential exposures to public (pathways, exposed persons, environmental transfers, habit data, dosimetry, etc.) is a radiological issue needing radiation protection experts.
• The definition of criteria, and the use of the criteria (if in terms of dose or risk associated to a dose) is a radiological issue too (despite is also linked to the safety features of the installation).
Is it Nuclear Safety or Radiation Protection?

- The identification and definition of source terms for potential exposures requires safety analysis/analysts (nuclear for certain facilities).
- In the Safety Guide we tried to discuss as less as possible source terms for potential exposure (the minimum to make sense the discussions on the assessments, despite many comments wanted more and more…).
Should we include the assessment of potential exposures to public in this Safety Guide?

- Is it a BSS topic?
- Is it necessary when you consider planned exposure situations?
- Is it related to emergency preparedness and response?
- Is it a Nuclear Safety or a Radiation Protection issue?
- Should we move to other Safety Guide?

Please Advice: Yes/No/Other

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From a panoramic style to a more prescriptive recommendation?

- Some topics depend on national laws and regulations other than nuclear (e.g. EIA and the broader environmental regulations, etc.) and there was a request via several comments to be as flexible as necessary.

- Some nuclear/radiological topics are not uniformly covered in the different member states (e.g. potential exposures – selection of types of accidents - criteria) and there was a request to include all the options and leave them subject to national choices.

- Flora and fauna explicit consideration was requested to be subject to national needs (some countries want to keep open the option based on the assumption that “protection of humans provide protection to the other species in the environment”).
From a panoramic style to a more prescriptive recommendation?

**Please Advice:**

*Yes/No/Other*

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Thanks!

D.Telleria@iaea.org