PREDIS WEBINAR ON WAC

Waste Acceptance Criteria 2: Needs, Challenges and Opportunities

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Outline of Lecture

- Introduction to WAC
- Derivation of WAC
- Roles of licensee
- Roles of regulator

Introduction to WAC – I.

- WAC are quantitative and/or qualitative criteria specified by an operator and approved by the regulatory body, for RAW to be accepted by the operator of a disposal facility, or by the operator of a storage facility for storage;
- WAC are a critical part of any storage/disposal facility programme;
- WAC = reasonable guarantee that any RAW pre-treatment (conditioning, packaging etc) is consistent with the storage/disposal concept;
- WAC are site and facility specific and are based on SC/SA and derived for
  - storage/disposal facility operation
  - the post-closure period of sdisposal facility

Introduction to WAC – II.

- Do not mix WAC with RAW classes, as defined in the IAEA GSG-1 or national RAW management classification schemes;
- RAW classess define qualitative properties of RAW from the perspective of futurer RAW disposal, cannot replace WAC and are not suitable to control RAW acceptance process to the facility;
- Any facility with well developed WAC can safely accommodate any RAW which complies with WAC, no matter what is the classification of RAW from disposal point of view

Derivation of WAC – I.

- The licensee shall establish preliminary WAC. The licensee shall update such preliminary WAC to reflect the development of the storage/disposal project;
- Prior the start of waste emplacement, the licensee shall specify WAC so as to ensure the conformity of the waste to the operational SC and for disposal also post-closure SC and other aspects of the RAW arrangements;
- No substantial difference in the WAC derivation process for facilities with small or large inventories

Derivation of WAC – II.

- WAC shall contain:
  - limits on important parameters such as radionuclide inventories and activity concentrations in individual waste packages, in specific parts of the storage/disposal facility and in the facility as a whole;
  - specify criteria to ensure that RAW accepted for storage/ disposal is physically and chemically stable over a timescale consistent with the safety case and compatible with other components of the facility;
  - limits on raw waste composition and waste package. Waste acceptance criteria for facilities under development shall take into account existing waste and their packages.

Roles of Licensee

- The licensee shall:
  - develop WAC/ report changes to WAC and submit them to RB for review and approval if appropriate;
  - ensure that the waste accepted for storage/disposal conforms to WAC (conformity - written arrangements which include administrative procedures, inspections and/or tests);
  - ensure that each waste package consigned for storage/disposal is traceable;
  - review the management system of the organization submitting waste and also review the quality of information provided by that organization;
  - establish procedures for dealing with waste packages that do not conform to WAC

Roles of Regulator – I.

- To establish regulations and issue guidance
- To issue, amend or revoke authorizations
- To review and evaluate safety cases submitted by operators
- To carry out inspections…

- Deficiencies frequently found during the RB review and evaluation of SCs:
  - Lack of conservatism
  - Depth of scenario analysis
  - Lack of integration of data during the evolution of the facility development
  - Conceptual model representation
  - Lack of justification and documentation

Roles of Regulator – II.

- Regulators expect that the operator (future licensee)
  - assesses compliance with quantitative radiological criteria
  - demonstrate that has well understanding of possible evolution
  - assure data and modelling tools of appropriate quality
  - assure appropriate management system
  - assure transparency and traceability of the assessment
  - process
  - has confidence in the results of safety assessment

Roles of Regulator – III.

- Where the common issues may be identified and how to approach to dealing with them?
  - Lack of experts (by itself and, in addition, for ensuring independence) experts within TSO ≠ group of experts working for operator
  - Time (timing, calculations especially for long-term safety are time consuming, in addition to expensive calculations tools)
  - Regulator relies on operator´s confidence in results of safety assessment → can be solved through TSO engagement (experts, human resource)
  - Not informing or involving regulator in the process as early as possible (ideally at the very beginning)

Roles of Regulator – IV.

- Too much freedom for operator in the process of optimizing the system and demonstrating its safety → boundaries (e.g. which period of time is that right one? how to threat the biosphere in different time frames?, etc.)
- Non adequate understanding of legislative and regulatory requirements → guidance and initial meetings as prevention
- Lack of using graded approach → risk of
  - of wasting effort at irrelevant areas
  - of not paying enough attention to dose relevant analyses
  - of overlooking critical scenarios and exposure pathways
- Failure based on engineering judgment, justification and documentation→ experts resource

Roles of Regulator – V.

- Specific issues
  - Lack of knowledge on system description and scenarios

  Non adequate understanding of scenarios evolution → how and under what circumstances may be RN released from a facility, how likely such releases are and what would be consequences of such releases to human and environment → lack of knowledge or data on
    - Site characterization (natural barriers – lack/incorrect information on interactions between RN and host rock, GW flows, saturated/unsaturated zones…)
    - Engineering barriers (defense in depth, material properties/lifetime, …)
    - Waste form and package (compressive strength, …)
  - RN inventory (chemical properties – Kd, Rd, solubility, etc.)

  Non adequate understanding and confidence in post-closure safety

Roles of Regulator – VI.

– Uncertainties

When developing conceptual model to demonstrate safety of the disposal system, uncertainties arise which need to be properly evaluated; the issue of uncertainties consist in to what extent can be quantified confidence in the results obtained. Three main sources of uncertainties (and thus related issues) are:

- Lack of knowledge of the system intended to model (e.g. no inclusion of some process in scenario development that may occurs in future – drastic changes of permeability, underground water flow, pH, influence of after flood conditions, etc.)
- Model itself and the validity of some attempts to simplified the model → validation and verification study for sources partially elimination – using set of FEPs
- Insufficient amount of input data or inaccuracies within input data → sensitivity analysis to minimize the consequences of uncertainty

Roles of Regulator – VII.

- the treatment of uncertainties which cannot be quantified (e.g. those associated to human intrusion, future biosphere evolution, etc.) – radiation doses to the individuals in future may be only estimated

  Such uncertainties, associated with estimated radiation doses, will increase for times farther into the future → there is a need carefulness in using criteria beyond the time, where uncertainties become so large that the criteria may no longer serve as a reasonable basis for decision making.

The inability to eliminate uncertainties shall be compensated by application of the precautionary principle.