“Relevant Radionuclide concept in Radioactive Waste Management”

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INTRODUCTION

- ✓ One of the long term consequences of the Fukushima Daiichi accident is the management of high volumes of radioactive waste generated during the accident and as consequence of remediation actions.
- ✓ The characterization of those wastes will play a key role in the definition of the future management strategies and in the assessment of clearance possibilities. That characterization must be planned and based on a list of relevant radionuclides that will optimize management costs and doses to workers and public.

- ✓ One of the challenges, both to the operator and to the regulator, is to adopt criteria to identify the radionuclides that will be relevant in the short, medium and long term. This information is essential to the generator for the design of practices and management systems for each type of waste.

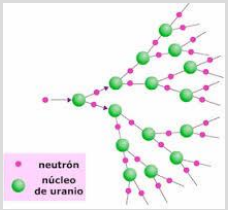
RELEVANT RADIONUCLIDE IDENTIFICATION - METHODOLOGY

Criterion 1

There must be a reasonable probability that the RN is present in the radioactive waste.

This is accomplished through:

- **Bibliographic research (A/D)**
- **Operating conditions (power, maintenance, etc.) (D)**
- **Constituent materials potentially activated (A/D)**
- **Neutron fluxes (D)**
- **Measurement of representative samples (A/D)**
- **Study of the operational history of the facility (D)**
- **Records (A/D)**



Criterion 2:

The RN must have the potential to generate a significant impact on the safety of some of the different stages of management: *handling, treatment, conditioning, storage, transport and disposal of radioactive waste*

Those RN which are present in the waste at a concentration below a given limit will have a negligible impact on the safety of RWM. For example, concentration values below the clearance levels should not be recorded.

RELEVANT RADIONUCLIDES IN THE SHORT TERM (Manipulation, Treatment and Conditioning)

At this stage, and with the aim of assessing the impact of external irradiation, only gamma emitters will be considered as relevant unless the characteristics of the RW justifies the analysis of other scenarios, such as, ingestion or inhalation. In that case the relevance of alpha and beta emitters present in the waste should be determined.

RELEVANT RADIONUCLIDES IN THE MEDIUM TERM (Storage)

In normal operation relevant RN will be the gamma emitters, as RW are already confined at this stage. There may be exposure scenarios associated with potential exposures, for example fire, requiring the evaluation of aerosol generation that could be relevant in such low probability situations.

RELEVANT RADIONUCLIDES IN THE LONG TERM (Final disposal)

Assessment of exposure scenarios (such as migration and intrusion). Through these scenarios the impact of radionuclides in future doses will be assessed and the maximum inventory allowed will be calculated.

CONCLUSIONS

1. **The “relevant radionuclide” concept is always related to a specific RWM step and to a group of exposures scenarios.**

2. **A RN is not “relevant” by itself since it can be present with a high activity concentration but have a short decay period, such as Co-60 that could be relevant in the first RWM steps and irrelevant in the long term.**

3. **The determination of the activity concentration of the relevant radionuclides is responsibility of the generator. That characterization should encompass all radionuclides that will be relevant through different step management using a methodology that satisfies the regulator.**

CONCLUSIONS

4. This characterization based on relevant radionuclide content at each step allows the prediction on how the RW will behave over time, so as to guarantee the safety both for workers and the public at every RWM stage.

5. The records system must take into account the long times involved (long term storage and final disposal) and ensure the appropriate transfer to the entity responsible for RWM.