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CENTRE D'ÉTUDES SUR L'ÉVALUATION DE LA PROTECTION DANS LE DOMAINE NUCLÉAIRE

Specificities of the ALARA approach for activities during the decommissioning of NPPs

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Introduction

- The ALARA approach has been widely implemented since two decades and is now routinely applied for maintenance activities in NPPs in operation.

- Numbers of NPPs are now under decommissioning or will be decommissioned in the near future :
  - Temptation to directly implement the organizational and technical means related to ALARA during maintenance activities to decommissioning activities,
  - Decommissioning activities have specificities, which can make this direct application not satisfactory.

Introduction - Preparedness of the task

- Insufficient preparation of an activity from the ALARA point of view may lead to important gaps between what was planned and what really happens :
  - Projected dose >> actual dose at the end of the activity : human and financial resources given to design and to select radiological protection options not adapted,
  - Projected dose << actual dose at the end of the activity : efforts made to reduce workers dose ALARA not sufficient,
  - In both case, a non-early detected or unexplained deviation of dosimetry shows a lack of preparedness of the activity.

- Feedback experiences from decommissioning activities : difference between projected dose before the start of the activity and the actual dose at the end of the activity may be significant.

Introduction - Issues to be considered

- What are the specificities of dismantling activities, which can influence the implementation of ALARA?

- How can the ALARA approach commonly implemented in maintenance activities be adapted to these specificities?

Decommissioning activities vs. maintenance activities

- Source term:
  - In operation: well know and controlled,
  - During decommissioning:
    - Dose rate mapping may be too old and unsuitable for an accurate dose prediction,
    - Inaccessible work areas, which imply that the radiological conditions should be modelled,
    - Lack of knowledge of the installation and its past events which had an impact on the source term during operation,
    - Source term in constant evolution (pipe cuttings, decontamination activities, waste elimination, etc.)
- Duration of the activity:
  - In operation: limited in time (duration of the outage),
  - During decommissioning: due to the nature of the task, may last several months or even a few years.

Decommissioning activities vs. maintenance activities

- Feedback experience:
  - In operation: important feedback for repetitive maintenance operations,
  - During decommissioning: mainly new activities, sometimes performed in facilities which are unique.

- Nature of the risk:
  - During decommissioning: these activities can involve risks, which are not commonly encountered during maintenance operation - e.g. internal contamination due to alpha emitters.

- Workers and contractors involved in decommissioning activities are quite often not familiar with works in a nuclear environment.

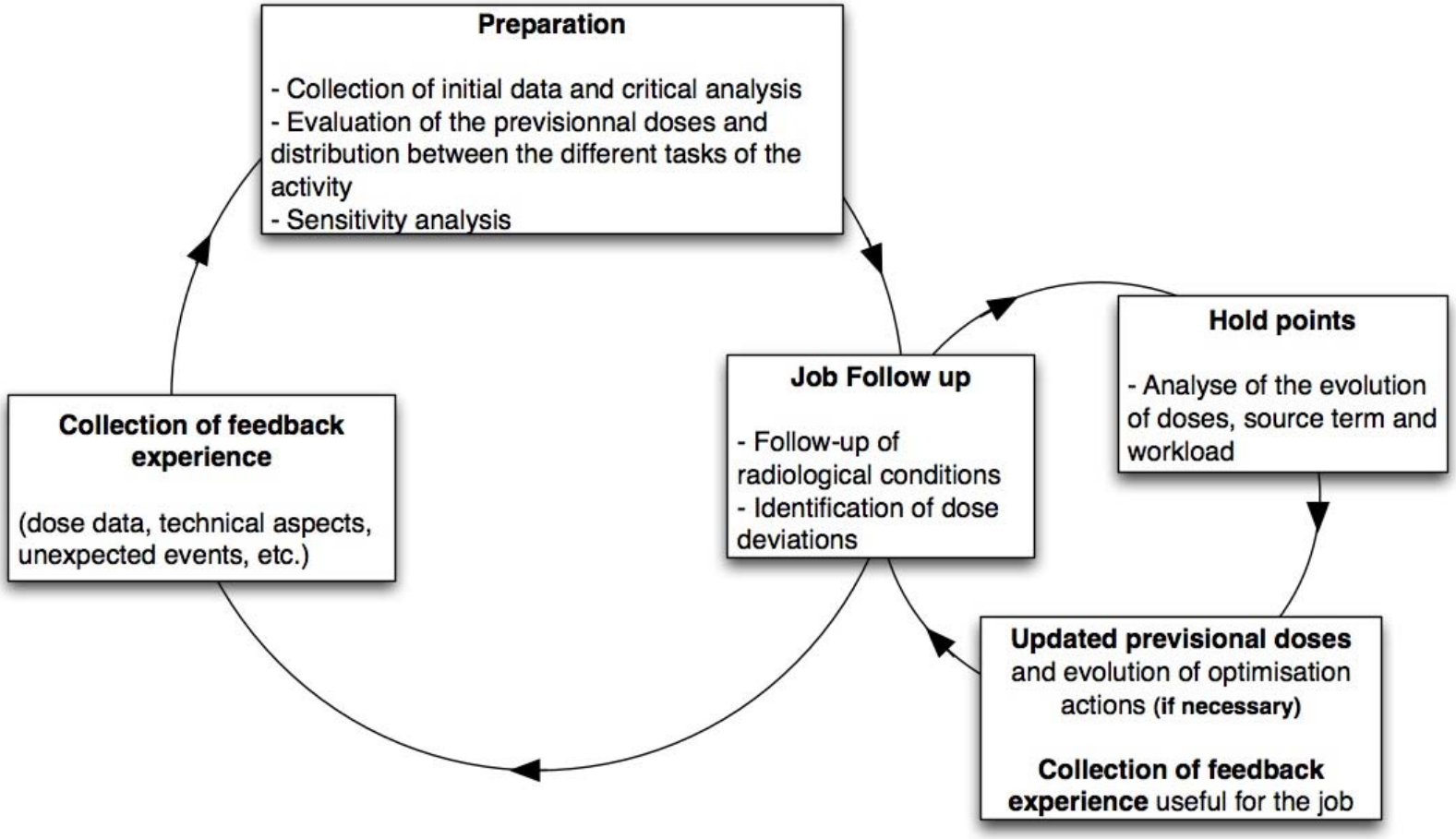
Adaptation of the ALARA approach to specificities of decommissioning activities

Specificities	Issue raised	Answer
Uncertainties on the source term Loss of knowledge of the installation and on the events which occurred in operation	Difficulties in the evaluation of initial radiological conditions Differences between projected and actual radiological conditions	Dose rate measurements/mapping adapted to the task to be performed Modelling of radiological conditions using hypotheses as realistic as possible Confirm the expected radiological conditions just before starting the work
Duration of the activities Repetitive tasks	Difficulties in the assessment of the exposed workload In particular, in the case of a repetitive task, consideration of the decrease of the workload for one task due to the improvement of operational methods	Regular hold points during the realization of the activities Regular analysis of the evolution of the dose assessment

Adaptation of the ALARA approach to specificities of decommissioning activities

Specificities	Issue raised	Answer
Evolution of the source term during activities	Anticipation of the source term evolution during the preparation of the activities	Sensitivity analysis during preparation Regular hold points during the realization to update the doses assessment if necessary
New activities Unique installations	Lack of feedback experience Use of existing feedback experience from different design installations	Need for collection of feedback experience both during and after the activities Collection of feedback on general techniques and issues raised by the techniques
Long workload in very low dose rate areas	High “theoretical” dose, which might not be registered because of operational dosimeter registration limits Overestimation of the doses associated with these activities	Favour electronic dosimeters with low registration limits Follow up of the evolution of dose and regular hold points

ALARA approach during decommissioning activities



Radiation protection E&T during decommissioning activities

- Good radiological protection is highly favoured by an efficient education and training program for all stakeholders, who intervene both in the preparation and the realization of the activity.

- Basic radiation protection E&T of persons working in decommissioning activities should be adapted to the specific risks of decommissioning :
  - Particular risk of internal exposure to alpha emitters,
  - Reinforced E&T for workers not used to work in a nuclear environment.

Conclusions

- Clearly no need to revolutionize the ALARA approach usually applied to maintenance activities to make it suitable to decommissioning activities.

- Specificities of decommissioning have impacts on important steps of the approach:
  - Careful **critical analysis of the initial data** (radiological conditions, workload) must be performed in order to be prepared to evolutions of these conditions. In parallel, a **sensitivity analysis** must be realized on the selected optimisation actions in function of the initial data and their potential evolutions,
  - **During the job follow-up, regular hold points** must be implemented in order to identify evolutions of the initial conditions and the concordance of the projected dose with the actual dose.

Conclusions

- Specificities of decommissioning have impacts on important steps of the approach:
  - Efforts should be made on the **collection of feedback experience** for future decommissioning activities. Even if each activity or installation is unique, there is an interest in identifying general good practices or ways of improvement.

- Sharing of experience, in particular through networks, is already well developed for NPPs in operation. This is clearly an issue to be developed stronger for decommissioning.