International Conference on Advancing the Global Implementation of Decommissioning and Environmental Remediation Programmes CN-238

Contribution ID: **130** Type: **Poster**

DEVELOPMENT OF PRACTICAL GUDIANCE ON OCCUPATIONAL RADIATION PROTECTION FOR APPLICATION IN DECOMMISINIONG OF NUCLEAR FACILITIES

Wednesday 25 May 2016 09:00 (9 hours)

Abstract: Nuclear decommissioning is an increased industrial activity in nuclear fuel cycle facilities owing to the fact that some of the nuclear installations have outlived its usefulness and hence remained under permanent shutdown. These facilities require safe decommissioning and subsequent restoration of site to general use. In order to facilitate this activity, IAEA is rendering all possible help to Member States to strengthen their infrastructure to ensure safe decommissioning. It developed several safety standards to provide guidelines for safe and successful implementation of decommissioning. A project sponsored by European Commission UNDER Cooperation of Nuclear Safety (CNS) has been designed by IAEA to develop a practical guidance supporting the Occupational Radiation Protection (ORP) during decommissioning. This manuscript discusses about the issues related to occupational radiation protection aspects of decommissioning strategy that includes identification of hazards, risk assessment, fingerprinting of radionuclides responsible for causing exposures and optimization of radiation protection. Besides, this also focuses on protection measures for dismantlement of active components and radioactive waste management. The need for sound radiation protection programme which encompasses effective workplace monitoring and individual monitoring is also emphasized.

1. INTRODUCTION

Occupational radiation protection plays important role entire nuclear fuel cycle activities. The sources of exposure in decommissioning phase are quite different from that of operational phase. Between the permanent shutdown and beginning of decommissioning activity there exists considerable time lag that causes short lived isotopes to decay down resulting in modification of type and magnitude of exposures. As a result of this, it is necessary to identify the dosimetrically significant radioisotopes that could probably enhance the exposures to workers.

2. METHDOS

The objective of a decommissioning plan is to remove the radiological and non-radiological hazards associated with the operation of a nuclear facility. According to the Basic Safety Standards [1], arrangements must be made for the assessment of the occupational exposure of staff, on the basis of individual monitoring where appropriate, including arrangements with appropriate dosimetry services under an adequate quality assurance programme. Towards this, fingerprinting the radioisotopes that causes exposures needs to be established. Among methods available for this, the operational history of plant provides useful information. Besides, the computer modelling [2] could also be used to ascertain the sources of exposures which again need to be validated with experimental measurements.

1. RESULTS IAEA has developed a TECDOC, which provides the practical guidance related to RP aspects of decommissioning. It outlines the need for strong radiation protection measures and suggests methodology to establish the radiation protection programme considering the varied degree of risks associated. Prior to decommissioning, a thorough assessment of radiological and non-radiological hazards and their corresponding risks should be conducted, with continuous re-assessment throughout the execution of decommissioning activities. A systematic methodology has been proposed for risk assessment process. There are two predominant hazards present in work environment i.e. radiological and non-radiological risks. With the removal of fuel elements, the risk of exposure has appreciably reduced compared to regular operations. However, numbers of industrial hazard are expected to be more in decommissioning stage compared to operational phase. These hazards have potential to influence the exposures from radiological hazards. In view of this, the precise determination of the hazards is essential. This involves identification hazards encountered by workers in work environment. Hazards identification results in risk estimation which in turn helps to make a sound risk assessment. Based on the risk assessment ORP is implemented. Decommissioning of a nuclear installation brings about changes that may impact the prevailing safety culture. There can be a perception that when moving from routine operations to decommissioning, the importance of radiation safety is reduced if the fuel is removed from the reactor or site. This could adversely impact the safety culture and is incorrect as, despite removal of the fuel, the level of risk to workers is not necessarily reduced.

High radiation levels may make deferred dismantling a more appropriate strategy because radioactive decay may allow radiation levels to decrease over time. However, there are limitations with respect to radionuclide

composition and dismantling techniques. For example, if radiological relevant nuclides with long half-life are occurring (e.g.241Am or 90Sr), the decay of easily measurable gamma-emitters with shorter half-lives (e.g.60Co and 137Cs) might lead to a nuclide composition which is difficult to measure and radio logically more challenging. Furthermore, expected dose reduction of workers may not be achieved because remote dismantling is replaced by manual dismantling. When no benefits from radioactive decay or changes in radiological conditions to unfavourable nuclide compositions are expected, immediate dismantling is the preferred strategy.

4. CONCLUSIONS

Decommissioning of nuclear facilities must be accomplished taking into account of radiological and non-radiological hazards. The optimization of protection and safety must be ensured.

REFERENCES

[1]. Basic Safety Standards, General Safety Requirements Part 3 (2014).

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INTERNATIONAL ATOMIC ENERGY AGENCY

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Session Classification: Session 4A - Poster

Track Classification: Technical and Technological Aspects of Implementing Decommissioning Programmes