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AN APPROACH OF THE INITIAL DECOMMISSIONING PLANNING FOR THE BRAZILIAN NUCLEAR RESEARCH REACTORS IEA-R1 AND IPEN/MB-01

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Abstract: The Brazilian Nuclear program has progressed in the past 60 years, resulting in six reactors, being four nuclear research reactors and 2 nuclear power plants. There is one more NPP under construction. With the establishment of the Brazilian Nuclear Energy Commission CNEN (Comissão Nacional de Energia Nuclear), in 1962, it was possible to tandardize the use of nuclear energy for peaceful purposes, regulating the activities and practices that use radiation or radioactive material. Regarding nuclear facilities, CNEN has specific legislation with various norms covering the licensing of nuclear installations and all necessary safety procedures for the operation nuclear facilities. However, the decommissioning has not been addressed, as a whole, by the current legislation. To comply with the intrinsic requirements of a nuclear plant shut down procedures, specifically the power reactors, only a resolution was published on nuclear power plants decommissioning in 2012.The aim of this work is to present the current stage of the study for the development of a preliminary decommissioning plan of the nuclear research reactors IEA-R1 and IPEN/MB-01.

1. INTRODUCTION

The present work shows an approach of the studies of the initial decommissioning planning of the research reactors IPEN/MB-01 and IEA-R1, both in operation at the Nuclear Energy Research Institute –IPEN in São Paulo city.

-The reactor IPEN/MB-01: it is a zero power type with maximum nominal power of 100W. The main characteristic is its versatility, allowing different core critical arrangements. The reactor has a main purpose carry out experiments and neutronic simulations of moderate reactors with light water, allowing the experimental verification of nuclear parameters.

-The reactor IEA-R1: it is a pool type with a maximum power rating of 5 MWth, with light water as the coolant and moderator, and graphite and beryllium as reflectors. The reactor is located in a multidisciplinary facility which has been consistently used for research in nuclear and neutron related sciences and engineering. The reactor has also been used for training, radioisotope production for industrial and nuclear medicine applications, and for general irradiation services.

2. METHODS

The methodology used is based on national standards and international recommendations. Several aspects have been considered to define the initial decommissioning strategy. They are: the radioisotopic inventories, the general analysis of the main factors affecting the decommissioning strategy selection (human resources, required technology, waste management in plants and health, safety and environmental impacts) and the international experience and strategies in research reactors decommissioning.

-The reactor IPEN/MB-01 has as a potential source of generation of radioactive waste the critical assembly due to be more susceptible to the neutron flux which has been considered the main component on this study.

-The reactor IEA-R1, has been in operation since 1957. Due the long operation time, the large amount of radioactive material come from the pool walls constructed by about 270m3 of high density concrete and 350m3 of ordinary concrete. Part of this concrete are exposed to neutrons and gamma radiation, arising during the operation of the reactor and shall be treated as radioactive waste. The study attempts to make an estimative about the amount of the concrete wall will be treated as radioactive waste arising from the possible dismantling of the reactor.

1. RESULTS

-Reactor IPEN/MB-01:

The results reveal that the material activities are considered low and most of the present radionuclides half-life is shorter than 100days, with rapid decay. The main components to be considered are the guide tube, the fuel rod coating and the intermediate spacing plate due to be closer to the core active region.

-Reactor IEA-R1:

The results show that the estimated amount of radioactive waste generated in decommissioning the pool right after reactor shutdown is 143m3. After 5 years or more this value decreases to 71m3.

1. CONCLUSIONS The present work come to contribute as a reference to develop decommissioning plans for other Brazilian facilities. In the world there are several cases reported about research reactors that

after its definitive shutdown had preserved their facilities and converted into museums or for other purposes which do not resulted in the dismantling of reactor building. It can be a good alternative for the IPEN/MB-01 and mainly the IEA-R1 once it was the first nuclear research reactor built in Brazil. REFERENCES [1] COMISSÃO NACIONL DE ENERGIA NUCLEAR, "Descomissionamento de Usinas Nucleoelétricas (CNEN-Resolução Nº 133)",(2012), Brazil. [2] INTERNATIONAL ATOMIC ENERGY AGENCY "Standard Format and Content for Safety Related Decommisioning Documents, (Safety Report Series Noº 45)"(2005),IAEA, Vienna. [3] INTERNATIONAL ATOMIS ENERGY AGENY "Decommissioning of research reactors: Evolution, State of the art, Open issues, (Technical Report Series 446)" (2006), IAEA, Vienna.

Country or International Organization

IPEN/CNEN Nuclear Energy Research Institute / Brazilian Nuclear Energy Commission

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