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THE USE OF EISENIA FETIDA AS BIOINDICATOR OF NUCLEAR ACTIVITIES

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Environmental sampling is one of the most important measures to strengthen the nuclear safeguard system. The collection of environmental samples, in context of the safeguard, aims to reveal information on treated materials and declared or even undeclared activities, as well. Usually two steps are involved, the first to establish the environmental fingerprint of the installation under observation, the second is to obtain compared these values with the environmental signatures. This strategy can also be used in nuclear forensic investigations. Samplings can be performed inside, outside or even near the facility under investigation, on surfaces, air, water, sediments, vegetation, soil and the local biota. In soil the earthworm is part of the biota, assimilating the metallic components during feeding or by skin absorption. The *Eisenia fetida* earthworm belongs to the Annelida Phylum, Oligochaete Class, the species known as California redworm, in Brazil, is widely used for the production of humus, since it has great ability to convert little decomposed organic residues into stabilized material. In the literature it has been already reported the ability of *E. fetida* to bioaccumulate several metals including uranium and other radionuclides. In this project we are studying the ability of *E. fetida* to identify nuclear signatures and its ability to be used as biomonitor in nuclear safeguards and nuclear forensic investigations.

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CFD ANALYSIS OF BLOCKAGE LENGTH ON A PARTIALLY BLOCKED FUEL ROD

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In LOCA accidents, fuel rods may balloon by the increasing of pressure difference between fuel rod and core vessel. With the balloon effect, the swelling can partially block the flow channel, affecting the coolability during reflood phase. In order to analyze the influence of blockage length after LOCA events, many numerical simulations using Ansys-CFX code have been done in steady state condition, characterizing the final phase of reflood. Peaks of temperature are observed in the middle of the fuel rod, followed by a temperature drop. This effect is justified by the increasing of heat transfer coefficient, originated from the high turbulence effects. Therefore, this paper considers a radial blockage of 90%, varying just the blockage length. This study observed that, for the same boundary conditions, the longer the blockage length

originated after LOCA events, the higher are the central temperatures in the fuel rod.

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**THE DISSEMINATION OF INFORMATION ABOUT NUCLEAR ENERGY
AND THE EXTERNAL EMERGENCY PLAN OF THE STATE OF RIO DE
JANEIRO, IN ANGRA DOS REIS, BRAZIL**

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The acceptance of nuclear energy and the risk perceived by the public are affected by past accidents with large media repercussion, like Chernobyl (Ukraine, 1986) and Fukushima (Japan, 2011), the first one because of its magnitude and the latter for still being fresh on people's minds (Visschers & Walquist, 2013; Pineda-Solano *et al.*, 2013).

Changing this perception based on shocking accidents can be difficult, but informing the public about nuclear energy and the risks imposed by it to them and to the environment helps reducing the population's concerns (Koerner, 2014; Visschers & Walquist, 2013; Pineda-Solano *et al.*, 2013).

A strategy to cope with public risk perception and achieve a good level of information and preparedness for emergency is risk communication.

This paper presents the result of a research with the workers of Education, Science and Technology of Angra dos Reis (SECT), Brazil, that attended a course given by State Civil Defense with the support of SECT and ELETRONUCLEAR. The course aims to diffuse the knowledge about nuclear energy generation and the External Emergency Plan of State of Rio de Janeiro for a nuclear emergency in the Nuclear Power Plant Almirante Álvaro Alberto.
