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FISSION PRODUCTS TRANSPORT AND CHEMISTRY INTO CANDU TYPE REACTOR DURING A SEVERE ACCIDENT

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Abstract. *The paper is intended to analyse the distribution of the fission products (FPs) in CANDU Primary Heat Transport (PHT) and CANDU Containment Systems, including chemistry, by using the ASTEC code. The source term of FPs, introduced into the PHT, was estimated by ORIGEN code. The data related to the nodes definitions, temperatures and pressure conditions were chosen as possible as real data from CANDU loss of coolant accident sequence (CATHENA code results). The FPs distribution and chemistry, in different nodes of the PHT and CANDU Containment, were obtained by a coupled calculation SOPHAEROS-CPA-IODE. All modules are integrated in SA code ASTEC.*

Keywords: severe accidents, fission products, safety, CANDU, transport

1. Introduction

The most important result of Severe Accident (SA) analysis is the source term (the radioactive sources released into the environment). The different fission products (FPs) are released from the fuel bundles through the clad rupture, transported by the coolant and deposited into different regions of the Primary Heat Transport (PHT) and containment system. Different hosts (aerosols, gas, liquids) are involved in transport and deposition phenomena. The chemistry process is taken into account in order to obtain a realistic model.

The ASTEC code is dedicated for SA analysis of PWR reactors and involves a lot of models and methods. Some of them are presented in [1, 2]. The use of ASTEC at CANDU type reactors introduces many difficulties especially for the core degradation phenomena [3]. A simplified calculation was presented in [4]. In this paper the problem of the FPs transport (during SA) between fuel bundles and containment is analysed by a coupled calculation SOPHAEROS-CPA-IODE. The FPs and chemical species distributions, in different PHT nodes, containment regions and hosts, are obtained.

2. Te definition of the problem

For PHT System only ½ of the circuit (see figure 1) was simulated: 190 horizontal fuel channels connected to 190 horizontal out-feeders, then through vertical feeders to the outlet-header; the circuit continues from the outlet-header with a riser and then with the steam generator and a pump. Two identical steam

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