THE OCTOPUS BURNUP AND CRITICALITY CODE SYSTEM

J.L. Kloosterman\textsuperscript{1}, J.C. Kuijper\textsuperscript{1} and P.F.A. de Leege\textsuperscript{2}

\textsuperscript{1}Netherlands Energy Research Foundation (ECN)
P.O.Box 1, NL-1755 ZG, Petten, The Netherlands
Tel: ++31 224 564402, Fax: ++31 224 563490
E-Mail: kloosterman@ecn.nl

\textsuperscript{2} Interfaculty Reactor Institute (IRI)
Mekelweg 15, NL-2629 JB, Delft, The Netherlands
Tel: ++31 15 2786618, Fax: ++31 15 2786422
E-Mail: leege@iri.tudelft.nl

ABSTRACT

The OCTOPUS burnup and criticality code system is described. This system links the spectrum codes from the SCALE4.1, WIMS7 and MCNP4A packages to the ORIGEN-S and FISPACT4.2 fuel depletion and activation codes, which enables us to perform very accurate burnup calculations in complicated three-dimensional geometries. The data used by all codes are consistently based on the JEF2.2 evaluated nuclear data file. Some special features of OCTOPUS not available in other codes are described, as well as the validation of the system.

INTRODUCTION

Nuclide inventories are usually calculated as a function of time by use of a multi-dimensional diffusion/burnup code with a limited number of nuclide chains or by a one-dimensional transport code coupled to a point-depletion code with an extensive number of nuclide chains. An example of the first method is the WIMS7 code system and of the second method the SAS2 driver of the SCALE4.1 code system. Both code systems are available at the Netherlands Energy Research Foundation (ECN). Nevertheless, for some problems a detailed multi-dimensional geometry is needed together with an extensive number of nuclide burnup chains. For detailed burnup calculations in a two-dimensional cluster geometry like that of CANDU fuel bundles, ECN has developed the SAS6 code system\textsuperscript{1} in cooperation with the Interfaculty Reactor Institute of the Delft University of Technology. Results with this code system are described in another paper at this conference\textsuperscript{2}.

This paper describes the OCTOPUS burnup and criticality code system which performs rigorous burnup calculations in any three-dimensional geometry. It interconnects all reactor