

ACTIVATION, DECAY HEAT AND WASTE ANALYSIS FOR A EUROPEAN HCLL DEMO CONCEPT

W. Pohorecki¹, S. Taczanowski¹, M. Kopec¹, R. Pampin², M.H. O'Brien²

¹ AGH University of Science and Technology, Kraków, Poland

² Culham Centre for Fusion Energy, Culham Science Centre, Abingdon UK

Corresponding author: poho@agh.edu.pl

Estimation and characterisation of the neutron-induced radioactivity in fusion reactor materials is the basis for their classification in view of radiotoxicity. The respective quantitative characteristics are: Clearance Index, (CI) deciding of the clearance of materials, the Contact Dose (CD) mainly determining the feasibility of recycling and the Heating Rate (HR) from its radioactive decay, responsible for the difficulties of disposal. The present study has performed an evaluation of the above characteristics for a European DEMO concept based on HCLL blanket technology, including their time behaviour and significance of particular nuclides.

Calculations of induced activity in the system produced valuable results, e.g. indicating sometimes the dominant contribution of very rare reactions or nuclides within hundreds years of decay. The main objective was to determine the activation of the various materials and components in order to quantify the amount and characteristics of wastes from the DEMO machine. Activation and decay heat levels of the components were calculated with the use of FISPACT 2007 and EAF 2007 library [1,2], on the basis of neutron fluxes throughout the structures of the tokamak calculated with the use of MCNP [3] and DEMO model by CCFE. The overall amount of wastes during operation and decommissioning were assessed, and a classification of the wastes provided on the basis of earlier work in the field and in agreement with EFDA, [4]. An illustrative example of a DEMO material balance 100 years after machine life end is presented in Fig. 1.

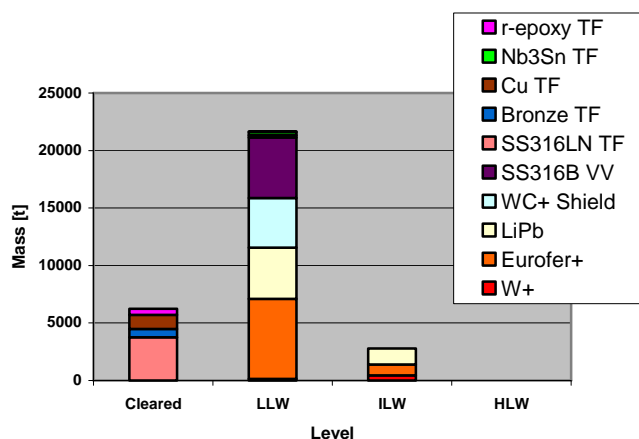


Figure 1: Example of DEMO material classification.

[1] R.A. Forrest, "FISPACT-2007 user manual", UKAEA report FUS 534, March 2007.

[2] R.A. Forrest, "The European Activation File: EAF-2007 neutron-induced cross section library", UKAEA report FUS 535, March 2007.

[3] J.F.Briesmeister, Editor, Los Alamos National Laboratory report LA-13709-M (March 2000)

[4] R. Pampin, et al., *Fus. Eng. Des.* **83** (2008) p1419.