Contribution ID: **280** Type: **not specified**

Neutronic assessments towards a comprehensive design of DEMO with DCLL Breeding Blanket

Monday, 17 September 2018 11:00 (2 hours)

On the way towards a comprehensive design of DEMO, step by step all the systems and components must be introduced as their definition or refinement progresses, in order to demonstrate the viability of a design on larger scale, i.e. leaving fewer margins to undetermined questions.
Among the EUROfusion Programme, new aspects have been recently fixed or furtherly developed as the Divertor, the First Wall (FW) and the Flow Channel Inserts (FCI) designs. Furthermore, the integration of Heating and Current Drive (H&CD) systems, as the Neutral Beam Injector (NBI), has started.
The introduction or modification of these systems and components could seriously jeopardize the nuclear behaviour of an initially validated Breeding Blanket (BB) DEMO concept, since many neutronics criteria - among others - could be no more fulfilled. Since the design of DEMO is a continuous upgrade under iterative process, as the refinement push on, most of the studies have to be repeated to demonstrate that criteria are still respected in a fully integrated design.
In this work the influence on Tritium Breeding Ratio (TBR) of a new design of detached FW protecting BB from extremely high heat fluxes is investigated. The impact of different typologies of FCIs is assessed also according to the degree of detail in the neutronic description. The divertor composition and its topology also reveal to have strong impact on responses apparently not related with its design, as the tritium production in the BB. Besides, the integration of NBI minimizing its invasiveness in the BB is verified by neutronic analyses concerning the main BB functions: fuel breeding and heat recovery. Accordingly, TBR and Nuclear Heating (NH) are assessed.
The study is performed for a Dual Coolant Lead Lithium (DCLL) BB DEMO although can be extrapolated to other BB concepts.

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Session Classification: P1