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P2.218 Progress in the design development of EU DEMO Helium-Cooled Pebble Bed primary heat transfer system

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In the frame of the activities promoted and encouraged by the EURO-fusion Power Plant Physics and Technology (PPPT) department aimed at developing the EU-DEMO fusion reactor, strong emphasis has been recently posed to the whole Balance of Plant (BoP) which represents the set of systems devoted to convert the plasma generated thermal power into electricity and to deliver it to the grid. Among these systems, a very important role is played by the Breeding Blanket (BB) Primary Heat Transfer System (PHTS) as it is responsible to extract more than 80% of the fusion plasma power.

In this framework, University of Palermo, Ansaldo Nucleare and CREATE have focused their work to improve thermal-hydraulic, safety and integration features of the Ex-Vessel PHTS for the Helium-Cooled Pebble Bed (HCPB) BB concept of DEMO.

Starting from the outcomes obtained last year that have allowed to highlight some criticalities which needed design changes, the paper describes progress and developments of the HCPB PHTS as well as the goals which have been achieved. The results of the research activity carried out show, in fact, an overall increase of both safety characteristics and thermal-hydraulic performances since a reduction in total coolant inventory and total pressure drop has been respectively reached. Nevertheless a critical assessment of these key parameters reveals that some issues are still open in terms of design integration and feasibility of the whole DEMO BoP for the helium-cooled blanket option, indicating that additional efforts are required to make this technology more attractive.

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