

EU DEMO Heat Transport and Power Conversion System design: options and status

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DEMO in Europe is considered to be the nearest-term reactor design to follow ITER, capable of demonstrating production of electricity, incorporating a closed fuel-cycle and being a facilitating machine between ITER and a commercial reactor. The aim of this paper is to present the conceptual design status and the options of the DEMO systems that are responsible for the removal of the plasma generated pulsed thermal power and its conversion into electricity delivered to the grid.

This description includes the two breeding blanket concepts: the Helium Cooled Pebble Bed (HCPB) Breeding Blanket (BB) and the Water Cooled Lithium Lead (WCLL) BB. Furthermore, it refers to the design of the plant option including the Primary Heat Transport System (PHTS), the Power Conversion System (PCS) and the Intermediate Heat Transport System (IHTS) - provided by an Energy Storage System (ESS) - in between PHTS and PCS, which is introduced in order to smooth the generated pulsed plasma power removed by PHTS transmitted to PCS for a more continuous conversion/production of electricity and to guarantee design plant lifetime.

The design criteria of PHTS, IHTS and PCS are outlined including consideration of safety and integration aspects. Description of the system's design, including the lay-out inside the

Tokamak, main equipment characteristics and preliminary costs, are also shown. Results of transient analyses indicating the plant behaviour at the transition between the pulse and the dwell will be provided, with the main aim to show system performance as well as the suitability of the plant concept and the adopted control strategy.

Finally, developments planned to investigate design simplifications and improved technology readiness actions, potentially leading to better plant reliability and cost minimisation, are presented (i.e., suppression of the IHTS through a direct coupling of the PHTS to PCS).

Keywords: EU-DEMO, Primary Heat Transport System (PHTS), Intermediate Heat Transport System (IHTS), Power Conversion System (PCS), ITER

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