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Interface and requirements analysis on the DEMO Heating and Current Drive system using systems engineering methodologies

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In this paper we present the analysis of System Requirements and Interfaces of the Heating and Current Drive (HCD) system of the Demonstration Fusion Power Reactor DEMO.

The work was performed applying Model-Based Systems Engineering (MBSE) refining the HCD System Architecture for assessing the system functions, its interdependencies and its overall integration into DEMO. Two concepts for DEMO have been considered: a conservative design (DEMO1) and a more advanced one (Flexi-DEMO). The effort has been undertaken in the frame of the Work Package Heating and Current Drive, supported by the Work Package Plant Level System Engineering, Design Integration and Physics Integration. The scope of the work is, on the one hand, to address the identification and definition of the interfaces occurring, both internally in the HCD system, and between the HCD system and neighboring systems. On the other hand, the impact of requirements coming from the ongoing physics studies has been assessed.

The rationale is to provide the technical foreground for supporting the decision-making processes related to the HCD system which is planned to be carried out during the Conceptual Design Phase, currently foreseen until 2027. The results we show in this paper are part of the design and integration activities consisting of both systems engineering methodologies and design analysis, all aiming at ensuring consistency in the overall EU DEMO plant design. The set of processes we report here is in line with the common approach established within PPPT and in accordance with the ISO Systems Engineering standard (ISO 15288).

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