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Progress of the CFETR Design

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The Chinese Fusion Engineering Test Reactor (CFETR), complementing ITER, is aiming to demonstrate fusion energy production up to 200 MW initially and to eventually reach DEMO relevant power level, to manifest high duty factor of 0.3˜0.5, and to pursuit tritium self-sufficiency with tritium breeding ratio (TBR) > 1. The key challenge to meet the missions of the CFETR is to run the machine in steady state and high duty factor. Recently, a self-consistent steady-state scenario for CFETR with fully sustained non-inductive current drive is developed using a multi-dimensional code suite with physics-based models. In addition, results from the experimental validation conducted by a recent EAST steady-state experiment with off-axis current drive enhance confidence in the performance prediction from the integrated modeling. Finally, a fully non-inductive reverse-shear scenario scaled to R = 6.7 m, βN˜3, H98 ˜ 1.5 and fBS ˜ 0.75 with the performance that meets the high gain CFETR mission is demonstrated. The scenario presents a self-consistent solution for the CFETR transport, equilibrium and pedestal dynamics.
At present, the CFETR physics design focuses on optimization of the third evolution CFETR (R = 7 m, a = 2 m, kappa = 2, Bt = 6.5-7 T, Ip = 13 MA) consistent with steady-state or hybrid mode and a radiative divertor. Listed below are the main tasks we needed to tackle in the near-term, e.g. to demonstrate compatibility with the alpha particle stability and transport, and to quantify the tritium burn-up rate during the steady-state burning plasma phase in order to find a solution to meet the central fueling requirement, and so on. The details will be given in this meeting

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