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Thermal-hydraulic and quench analysis of EUROfusion DEMO PF coils

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The poloidal field coils (PF1 to PF6) of the proposed EUROfusion DEMO machine are to be operated in the pulsed mode. The heat is deposited in these coils due to field changes during a normal plasma cycle, due to field changes corresponding to a range of plasma control actions, due to nuclear heat load, etc. The PF2-PF5 coils winding packs (WP) are made up of the NbTi cable-in-conduit conductors (CICC) without a low-impedance cooling channel. The PF1 and PF6 coils are wound with the Nb3Sn CICC with a separate low-impedance cooling channel. In the proposed work, we first estimate the contribution to the total heat deposition by various factors. Then a thermal-hydraulic performance of all the WPs are evaluated during the normal operation. Thereafter, a quench analysis is performed to determine the maximum hotspot temperatures.

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