

## **Advance in the conceptual design of the European DEMO magnet system**

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Abstract:

The European DEMO, i.e. the demonstration fusion power plant designed in the framework of the Roadmap to Fusion Electricity by the EUROfusion Consortium, is approaching the end of the pre-conceptual design phase, to be accomplished with a Gate Review in 2020, in which all DEMO subsystems will be reviewed by panels of independent experts. The latest 2018 DEMO baseline has major and minor radius of 9.1 m and 2.9 m, plasma current 17.9 MA, toroidal field on the plasma axis 5.2 T, and the peak field in the toroidal-field (TF) conductor 12.0 T. The 900 ton heavy TF coil is prepared in four low-temperature-superconductor (LTS) variants, some of them differing slightly, other significantly, from the ITER TF coil design. Two variants of the CS coils are investigated—a purely LTS one resembling the ITER CS, and a hybrid coil, in which the innermost layers made of HTS allow the designers either to increase the magnetic flux, and thus the duration of the fusion pulse, or to reduce the outer radius of the CS coil. An issue presently investigated by mechanical analyzes is the fatigue load. Two variants of the poloidal field coils are being investigated. The magnet and conductor design studies are accompanied by the experimental tests on both LTS and HTS prototype samples, covering a broad range of DC and AC tests. Testing of quench behavior of the 15 kA HTS cables, with size and layout relevant for the fusion magnets and cooled by forced flow helium, is in preparation.