Contribution ID: **436** Type: **not specified**

P4.100 Analysis of the effect of a plasma disruption on the DTT Toroidal Field magnets

Thursday, 20 September 2018 11:00 (2 hours)

The long plasma pulse duration and the large thermal loads expected in the EU DEMO reactor, currently under design, represent a challenge for the power exhaust and ask for a new, robust design of the divertor. For this reason, the design of a satellite fusion experiment, the Divertor Tokamak Test (DTT) facility, is being pursued in Italy. This fully superconductive compact tokamak, which must be very flexible in terms of plasma configurations, will be the test bench of several DEMO-relevant divertor solutions.
Among the different ex-vessel coil sub-systems, the 18 Toroidal Field (TF) magnets, cooled by forced-flow supercritical helium at 4.5 K, will be the closest to the plasma. Therefore, during fast plasma disruptions large heat loads are deposited in the TF coils, so that the available temperature margin could be eroded up to the initiation of quench, followed eventually by a fast discharge of the coils. A quench causes additional heat deposition in the magnets and typically venting of helium gas, so that some time is needed to re-cool the vented He and the TF coil before restoring the normal operation of the machine, with an impact on its availability and operating costs.
A detailed thermal-hydraulic model of the DTT TF coils is developed here using the 4C code. The model is applied to the simulation of a plasma disruption, assessing which is the minimum He mass flow rate to be retained in the design, in order to avoid any quench initiation during such a severe transient. The option for the tokamak control system to trigger a fast current discharge after the disruption is also investigated, to assess if a quench could be induced during the dump and thus giving important feedbacks to the protection system design.

Presenter: BONIFETTO, Roberto (Dipartimento Energia Politecnico di Torino)

Session Classification: P4