Contribution ID: **570** Type: **Poster**

Thu-Af-Po.07-03: Quench simulations of a 3×3 field shaping NI HTS coil array for a planar coil stellarator

Thursday 3 July 2025 14:00 (2 hours)

Stellarators confine plasma in a stable toroidal configuration using twisted external magnetic fields. However, this requires complex 3D coil shapes that can pose a significant design, manufacturing, and maintenance challenge. To address this challenge, Thea Energy, Inc. is developing the planar coil stellarator. This approach utilizies multiple smaller, individually energized coils that collectively produce the requisite 3D magnetic field necessary for sustaining continuous fusion reactions.

We introduce the "Canis"3x3 array of high-temperature superconductor (HTS) planar coils, and present a transient coupled thermal, electromagnetic and mechanical finite element model to analyze quench behavior. In particular, we focus on turn-to-turn resistance requirements for the non-insulated (NI) coils with respect to quench tolerance and quench resistance. Further details on the evaluation of the array's performance under realistic and hypothetical scenarios, such as induced currents due to electromagnetic coupling, and operation in a strong background field generated by encircling coils, are shared. These results offer key insights for the design of simplified stellarators, paving the way for a simpler approach to commercial fusion energy.

Author: OLATUNJI, Jamal (Thea Energy)

Co-authors: CHEN, Brian (Thea Energy); NASH, Daniel (Thea Energy); NORONHA, Silvester (Thea Energy); TANG, Kevin (Thea Energy); WU, Ryan (Thea Energy)

Presenter: OLATUNJI, Jamal (Thea Energy)

Session Classification: Thu-Af-Po.07 - Quench in Fusion Magnets I