

Infinity One Stellarator - A Multiphysics Analysis

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Abstract

Type One Energy Group is working aggressively to build Infinity One, a steady-state magnetic confinement fusion device that will pave the way to a fusion reactor for electricity production. The complexity of this device and its intrinsic diversity of systems makes COMSOL Multiphysics an indispensable tool for analysis and design. A key component of Infinity One is its non-planar magnetic coils. This work presents the magnetic, thermal, and structural analysis of a high-temperature superconductive magnet prototype where the multiphysics and temperature-dependent material capabilities played a critical role. In addition, some other analyses, such as magnetic field topology, transient event induced-current, and vacuum system analysis, will be shown. Some analyses used the client/server feature to run heavy computational models in a cluster (64x AMD EPYC 9124 16-Core Processor, 3.0 GHz, 1.5 TB RAM, 216 TB storage). In addition, since our workforce is located in four different offices across North America, the Model Manager and Model Manager Server were key components for version control, sharing our models, and taking advantage of personnel specialty.