Karlsruhe Institute of Technology

Press Release

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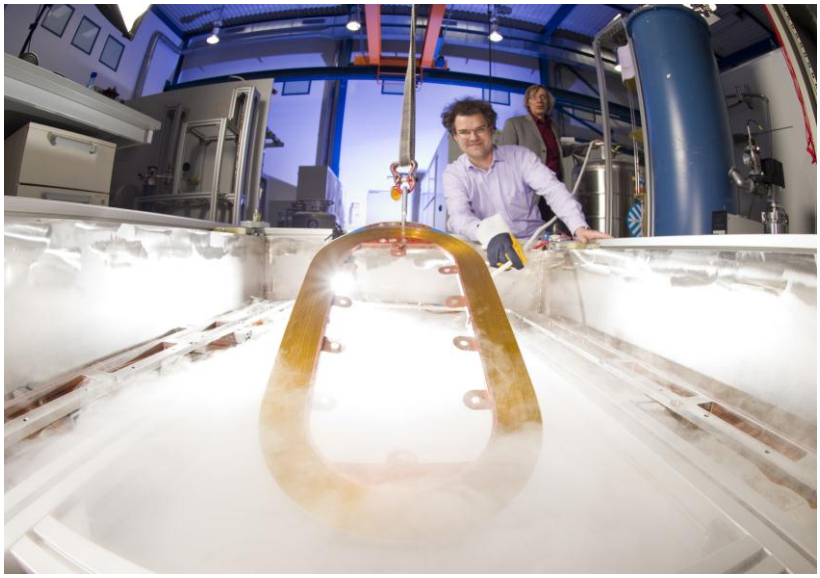
Less CO_2 Emissions of Large Power Plants

KIT and Siemens Launch Research Project on Superconducting Generators



Prototype: Coil for a future generator in a cooling pool filled with liquid nitrogen. (Photo: Siemens)

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Use of high-temperature superconductivity in electricity production to reduce CO_2 emissions is the objective of a joint project of the KIT Institute of Technical Physics (ITEP) and Siemens AG. Researchers develop the fundamentals of superconducting generators to enhance efficiency of large power plants. The project presented at the Hanover Fair is funded by the Federal Ministry of Economics and Technology.

Superconductors are materials that do not have any electrical resistance below a certain temperature. In case of high-temperature superconductors (HTS), this so-called critical temperature is relatively high, such that they can be cooled at lower costs. On their basis, novel components can be developed for energy technology. Superconducting materials and energy applications are among the central research areas of ITEP. In the past years, Siemens Corporate Technology built and tested various electric machines based on HTS, the last component manufactured was a high-torque engine of

4000 kW with 120 rotations per minute. HTS technology was found to reduce losses of the machine by 50%. Efficiency is increased accordingly.

Now, the benefit of improved efficiency shall also be applied to larger electric machines: Power plant generators of 150 to 900 MW power. An efficiency gain of 0.5% would significantly reduce CO_2 emissions and be of major benefit to the environment.

However, great technical challenges have to be managed: The HTS wires have to be kept reliably at an operation temperature of about -240°C. They are mechanically sensitive, but subjected to a centrifugal acceleration of 5000 times the acceleration due to gravity. At the same time, power plant generators have to meet highest reliability requirements.

In their joint project, KIT and Siemens create a sound basis for future developments of superconducting power plant generators. In cooperation with Siemens, ITEP will design a rotation test rig for testing components and technologies under realistic conditions. Among them will be cryostat concepts, thermal insulation, and cooling processes as well as the robust HTS coils of high ampacity required by such generators A major milestone is the development of a rotating superconducting test coil to demonstrate the maturity of the technology. Upon the successful completion of the project, the first prototype of an HTS generator will be built.

KIT and Siemens cooperate in this project based on a framework agreement on developments in energy technology. The project is funded by the Federal Ministry of Economics and Technology and managed by the Jülich Project Management Agency (PTJ). At the Hanover Fair from April 4 to 8, the partners will present their project at the joint stand D60 “SuperConductingCity” in hall 13.

Karlsruhe Institute of Technology (KIT) is a public corporation and state institution of Baden-Wuerttemberg, Germany. It fulfills the mission of a university and the mission of a national research center of the Helmholtz Association. KIT focuses on a knowledge triangle that links the tasks of research, teaching, and innovation.

This press release is available on the internet at www.kit.edu.