

CONVERTEAM Completes Full-scale Testing of First HTS Coil for a Hydroelectric Generator

(A Milestone in the Construction and Commissioning of the Generator)

March 13, 2009 (HP19). CONVERTEAM UK Ltd., a company involved in power conversion engineering, released [press information](#) on the completion of full-scale testing of an HTS coil fabricated for installation in a hydroelectric power generator currently under completion. The intended main parameters of that generator are: rated power 1.7 MW, line voltage 5.25kV, 28 pole, 214 rpm. The generator will consist of superconducting HTS field coils, first of which was now successfully tested, and a conventional stator. The artist's conception of the machine is shown in Figure 1. This generator is being designed and built by CONVERTEAM UK Ltd. at its facility in Rugby, UK, as a part of a collaborative project partly funded by the European Union*. CONVERTEAM is the lead partner in this project.

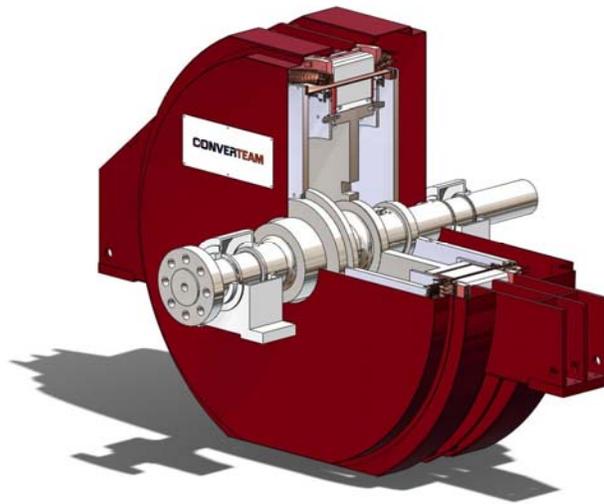


Fig. 1. Artist's conception of the CONVERTEAM hydrogenerator demonstrator.

The generator is to be installed at a hydro power station in Hirschaid, Bavaria, Germany, operated by E.ON Wasserkraft GmbH, one of the major German energy providers. The machine is intended to be a technology demonstrator for the practical application of superconducting technology for sustainable and renewable power generation. The generator is to replace and uprate an existing conventional generator and will be connected directly to the German grid. The HTS field winding uses Bi-2223 tape 1G conductor cooled to about 30 K using high-pressure helium gas which is transferred from static cryocoolers to the rotor via a bespoke rotating coupling. The coils insulated with multilayer insulation will be positioned over laminated iron rotor poles held at room temperature. The rotor will be enclosed within a vacuum chamber and the complete assembly is to rotate at 214 rpm, as indicated above.

For this project, CONVERTEAM built a new cryogenic test laboratory in Rugby. The facility includes a clean room and a 5 m³ cryostat, built especially for coil testing. Figure 2 shows a photo of the test cryostat during the coil installation. The completed test of the first coil included the successful cooldown and the attainment of the design magnetic field. The coil was subjected to the worst extremes of conditions expected in operation at the power station. The successful completion of testing of the first HTS coil validates both the coil design and its manufacturing and winding processes performed by Zenergy Power GmbH (formerly Trithor), at their facility in Rheinbach, Germany. The successful test gives the

green light to building of the generator and to winding of the remaining coils at Zenergy Power. The testing of the completed generator is scheduled for late 2009. Upon successful commissioning, the hydroelectric generator will be subjected to a 6 month field trial operation at Hirschaid, supplying electricity to the German grid.



Fig. 2. Work on the coil test cryostat at the Rugby cryolaboratory.

The challenges have been apparently significant, but have allowed project partners to develop key technology building blocks which can be applied also to future HTS related projects.

Thus far, the partners' contributions to the project have been:

- Generator and coil design, and coil testing by CONVERTEAM UK, Ltd.
- Coil manufacturing by Zenergy Power GmbH.
- Support in coil testing and quality concepts for HTS coils by Silesian University of Technology, Poland.
- Cryocoolers and supply of cryogen, along with developing a low-maintenance cryocooler for the intended application – by Stirling Cryogenics and Refrigeration BV, the Netherlands.
- Network analysis and on-site machine installation concept by KEMA Nederland BV.
- New analytical software tools for efficient generator design by Vector Fields, Ltd, UK.

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