

# Feasibility Study on Introduction Effects of Superconducting Fault Current Limiting Transformer (SFCLT) into Electric Power System

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## 【 Outline of survey 】

The prime feature of SFCLT is that SFCLT works as a superconducting transformer in the normal operating condition, whereas acts as a superconducting fault current limiter in the fault condition. As the Phase-1 of the SFCLT project, EMTP analysis has been carried out to optimize the operating parameters of SFCLT in a simplified model system. According to the EMTP analysis, as the Phase-2, a scaled-down model of a LTc-SFCLT with NbTi coils at liquid helium temperature was designed and fabricated, and its fundamental functions were verified. As the Phase-3 of the SFCLT project, a HTc-SFCLT with BSCCO2212 bulk coils was designed, fabricated and tested at liquid nitrogen temperature. The problem of recovery into superconducting state after quench and current limitation has also been conquered.

As the Phase-4 and Phase-5 of the SFCLT project, this project aims at the rating enhancement, loss reduction and optimization of the HTc-SFCLT and its feasibility assessment.

## 【 Expected results 】

As the highly-advanced electric power apparatus for the next generation, various kinds of superconducting power apparatus (transformers, fault current limiters, cables, generators, motors, SMES, etc.) have been developed, aiming at the functional improvement as a single apparatus. On the other hand, SFCLT has been proposed from the viewpoint of system coordination and functional diversification of superconducting power apparatus and systems. If the technical feasibility of the HTc-SFCLT will be verified through this project, a new advantage of rational and highly-reliable construction and operation in future superconducting power apparatus and systems can be expected, in addition to the conventional advantages of the reduced loss, size and environmental load.

## 【 References by the principal researcher 】

- (1) C. Kurupakorn, N. Hayakawa, N. Kashima, S. Nagaya, M. Noe, K. -P. Juengst, H. Okubo:  
“ Development of High Temperature Superconducting Fault Current Limiting Transformer (HTc-SFCLT) with Bi2212 Bulk Coil ”, IEEE Transactions on Applied Superconductivity (to be published).
- (2) N. Hayakawa, H. Okubo: “ High Temperature Superconductivity 1 - Materials, Electrical Insulation for Superconducting Power Apparatus ”, Springer, pp.339-375 (2004).

【 Term of project 】 F Y 2004 - 2008

【 Budget allocation 】 83,800,000 yen

【 Homepage address 】 <http://www.okubo.nuee.nagoya-u.ac.jp/index.shtml>