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SMES Development in Japan

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abstract

Superconductivity technology can be applied in the field of electric power for power generation and transmission and transformation, due to its characteristic of making it possible to achieve a high current. Above all, much is expected of the application of superconductivity technology to the storage of electric power, and the development of such systems is in progress both in Japan and abroad.

Superconducting Magnetic Energy Storage systems (SMES), making use of the feature of zero conductor resistance for a continuous flow of electric current, can store electric power without any energy conversion. Since it has a high power conversion rate in comparison with other methods of storage and the storage parts do not experience the deterioration that arises from repeated rapid electrical discharging and charging, it is being developed for use in the control of electric power systems and in compensating for instantaneous voltage dips. However, for it to be put to practical use, the whole system must be made more efficient and more compact and costs must be lowered.

In 2004, in connection with the development of SMES for electric power system control, the Japanese Energy and Resources Agency began a national project aimed at testing actual interconnected systems. Our company is participating in this project, and is also conducting field tests in cutting-edge liquid crystal factories in Japan with the purpose of developing SMES to be used in compensating for instantaneous voltage dips.

In this project, in addition to developing a high-efficiency, low-cost converter and experimenting with a small working prototype of it, we are testing out the concept for a future actual-size container with an optimal coil shape, by appraising the capability of superconducting coils using next-generation wire rods, and we will give an outline of this work, here.

We will also introduce a device that has been developed for compensating for instantaneous voltage dips and whose compensating action has been checked in tests and found to be accurate.