

An update on the status of large-scale electric power storage systems for supply and demand control in Japan

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Abstract

Since the Great East Japan Earthquake in 2011, Japan has introduced feed-in tariffs for renewable energy resources to improve the nation's degree of energy self-sufficiency and to decrease greenhouse gas emissions. However, connecting large amounts of variable renewable energy systems to the electric power grid may destabilize the control of power supply and demand.

Recently, verification tests of large electric power storage systems for supply and demand control have been planned and carried out. Storage systems analyzed include redox flow batteries, sodium-sulfur batteries, and lithium-ion batteries. In this presentation, we will introduce the properties of these batteries and provide an overview of large electric power storage systems that have been installed in Japan for these verification tests.

In addition, we will introduce work at CRIEPI to evaluate lithium-ion batteries. Our evaluation techniques allow us to characterize lithium-ion batteries from a user perspective while also investigating what is happening inside the battery. Focusing internally, we can disassemble the batteries and investigate the properties of the positive and negative electrodes individually. Conversely, we can precisely measure a battery's voltage and temperature during charge and discharge cycles, without requiring disassembly. By combining these perspectives, we can suggest the mechanism that causes performance deterioration and estimate a battery's lifetime.