Preface

Development of Components of Switching, Protection, and Control Equipment to New Electric Power Distribution Systems in Japan

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Throughout the world, the environment surrounding energy and power has changed rapidly in recent years. In the 1990s, a fossil fuel shortage and global warming were the primary concerns, and efforts to reduce greenhouse gas emissions were attracting attention. Subsequently, in Japan, in the aftermath of the Great East Japan Earthquake that occurred in March 2011 and the nuclear disaster at the Fukushima Daiichi Power Station of the Tokyo Electric Power Company, attitudes toward the power environment have changed significantly. In particular, the following issues are being discussed: (1) the large-scale adoption of renewable energy, (2) reduction of energy costs and greenhouse gas emissions, and (3) the stable supply of energy and power, during times of peace and times of crisis.

In June 2014, the Japanese government unveiled its so-called "Growth Strategy." The Cabinet approved a "Fourth Basic Energy Plan" that specifies a new energy policy, and these policies are currently being implemented. For example, Japan's target for reducing emissions of greenhouse gases by FY2020 has been lowered to 3.8% of FY2005 levels, and this target value does not include the greenhouse gas reduction effect that results from the use of nuclear power. On the other hand, the decisive action of "power system reform" has also been clearly shown. In a first stage, the government will revise its "Electric Utility Law" and establish an "Organization Promoting Wide-Area Operations," and in a second stage, the government will advance the overall liberalization of entry to the power retail business. The performance goal for these power system reforms is to complete them by 2020.

To achieve this goal, various measures are about to be undertaken. One such measure is to realize an energy supply that is both clean and economical. Specifically, this measure calls for the large-scale adoption of renewable energy, such as wind power and solar power. A basic demonstration test of floating wind turbines is being advanced by positioning one floating wind turbine offshore each of Fukushima and Nagasaki prefectures, and commercialization by 2018 is targeted. In conjunction with this, large-capacity storage batteries also continue to be promoted for wider use. As of March 2014, the number of in-use stationary lithium-ion storage batteries totaled 17,000 units, and Fuji Electric aims to acquire 50% of the global market for these types of large-capacity storage batteries by 2020.

The construction of smart communities that use smart grids to efficiently utilize energy and power is being proposed as an application of energy-saving technology. Currently, four smart community districts in Yokohama City, Toyota City, Keihanna Science City (Kyoto), and Kitakyushu City are undergoing demand response demonstration tests. An aim of these tests is to acquire basic data about the operation of smart grids and smart cities in Japan, and to develop management techniques. Another aim is to create international standards based on the demonstration tests so that new energy technology, energy saving technology, and smart grid and smart city-related technology possessed by Japan can be deployed internationally. Various forms of energy management systems (EMS), including Community EMS (CEMS), building EMS (BEMS), mansion (condominium) EMS (MEMS), home EMS (HEMS), and so on, are being tried with these demonstration tests. During the summer of 2013, the Yokohama Smart City Project conducted demand response demonstration tests for 1,200 households equipped with a solar power generation system and a HEMS, and found that a maximum peak demand reduction rate of 15.2% was realized. It is important for these types of Japanese-style smart grids and smart cities to be established, and then deployed overseas.

Under such circumstances, demand is increasing for the various components used in switching, protection, and control equipment, and there is a growing need to improve the performance of these components. The industry is rapidly developing smart meters, power conditioners, various monitoring systems, and supervisory control systems. As the supporting elements for this equipment, the development of power semiconductors and storage batteries is obviously important, but the realization of improved performance, smaller size and higher reliability of electromagnetic contactors, relays, load break switches that interrupt fault current, and the like, in a form that is competitive overseas, is

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also important. When smart grids and renewable energy are to be used, a DC power supply system becomes important. Presently, DC systems are being put into practical use at data centers, railways and the like. We expect that DC power will be distributed via smart grids in the future, and in consideration of the increase in received power, that higher voltage and larger current of the DC supply system will be required. Accordingly, we must accelerate the development of equipment for high-voltage DC supply systems, and especially the development of switching and protection equipment.

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