Hitachi's Electric Power and Energy Systems

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WE live in a time when global warming has shrunk the Himalayan glaciers and led to a retreat of the ice cap on Mount Kilimanjaro. These phenomena are caused by an increase in the level of carbon dioxide in the atmosphere from 280 ppm before the Industrial Revolution to 380 ppm now, with most of this increase being due to the use of fossil fuel. On the other hand, a major factor driving the price of oil is fear that the volume of oil produced will reach a peak in the near future and this is sowing confusion in the world economy. In response to these issues of global warming mitigation and long-term energy security, Hitachi, Ltd. has developed nuclear and renewable power generation technologies that do not release carbon dioxide as well as thermal power generation technology that has the highest efficiency in the world.

In the field of thermal power generation, we have researched and developed the A-USC (advanced ultra super critical) and AHAT (advanced humid air turbine) technologies that achieve significant improvements in generation efficiency. In the field of CCS (carbon capture & storage), we have been developing oxy-coal combustion boiler technologies in cooperation with several European universities. A pilot installation of carbon capture equipment at an integrated gasification combined-cycle plant has been constructed in Japan as a national project. This issue covers the latest technology for pulverized-coal-fired boilers which significantly reduce NO*x* (by 40%) for the same level of CO.

General Electric Company and Hitachi have jointly developed highly reliable boiling water reactors of the ABWR (advanced boiling water reactor) and ESBWR (economic simplified BWR) types. We can provide our customers worldwide with choices that best fit their individual needs.

Renewable energies such as hydroelectric, wind and photovoltaic generation are expected to play a big role in mitigating global warming. Stable operation over a wide range of conditions is required for pumped-storage hydroelectric power plants. Hitachi has developed a pump-turbine with a wide operating range in generating mode using computational flow simulation. Fuji Heavy Industries Ltd. and Hitachi have jointly developed a 2-MW downwind turbine tailored to Japanese conditions such as the presence of updrafts and higher wind speeds on the slopes of mountains. When significant numbers of large-scale wind and solar power generation systems are incorporated into the power grid, they may cause voltage and frequency fluctuations on the grid. Therefore, we have developed a high-capacity power conditioning system for use with large-scale power generation systems that helps maintain the stability of the power grid, which was part of a project run by New Energy and Industrial Technology Development Organization (NEDO). In this issue some of the research and development associated with these technologies are described.

This issue of the Hitachi Review highlights some of the latest technologies and developments in the areas of electric power and energy. Although the technologies introduced here represent only a small portion of those under development at Hitachi, we believe they will support further advances in power and energy systems.