Tuesday, September 15, 2009, 10:45am -12:00am

[Breakout Session 3] The future of the electrical power transmission and distribution systems in Asia

Atsushi Denda, Deputy Director, Shimizu Institute of Technology, Shimizu Corporation

Kunio Takagi, Manager, Consultancy Services Management Group, International Affairs Department, Tokyo Electric Power Company

Satoshi Nagata, President, CEO, VPEC Inc.

Yuji Nishimura (moderator), Managing Director of Management Consulting & Integrated Markets, Accenture Japan Ltd.

Thanks to interest spurred by the United States' Green New Deal policy initiatives, smart grids are gaining attention as a means to realize a low-carbon society by countries around the world. According to Mr. Nishimura, smart grids are not uniform, but diverse, and because of this, how they develop is by nature diverse, as well. Against this backdrop, we are seeing test trials utilizing smart grids around the world. For example, in Boulder, Colorado, there is an actual experimental smart grid city the size of Setagaya Ward in Japan and focused on electricity to replace old electrical grids with new systems. On the other hand, in an experiment in Amsterdam, The Netherlands, they are trying to change entire lifestyle systems, not just electrical networks. In addition to installing smart meters in each household and energy-saving technologies in office towers and government buildings, they are building gas stations in numerous areas around the city. In Portugal's Plan IT Valley, towns are being built on an experimental basis on new land provided by the Portuguese government. This area doubles as a special economic zone where they have built an R&D Center and other facilities. Through smart grids, the government is striving to enhance the value of the land.

In both Europe and North America, the movement toward building new electrical power transmission and distribution systems is providing insight for Asia on a new model for the ideal smart grids. Mr. Takagi, in his presentation on Tokyo Electric's efforts in this area, asserted that smart grids can overcome the four demands of electric systems. The first demand is that it

be an urban formation. Tokyo Electric supplies the equivalent of one-third of the nation's total electricity to the Kanto Region, which makes up just 10 percent of Japan's total land area. Here in this area, to solve the problem of inequities in electricity supply and demand, the electrical system is large scale with a degree of flexibility built in to supply the areas it serves. This experience was utilized by China in their trial to transmit large volumes (1 million volts) of energy over long distances. In addition, to overcome the problem of scarce land in metropolitan areas, Tokyo Electric has built underground electric power substations. In such ways, electrical systems unified with the city form are being built to accommodate the growth of cities, and these methods are being adopted by such cities as Shanghai in China.

The second demand of electric systems is that they protect the cities they serve. After a summer 1987 accident involving a power voltage collapse, Tokyo Electric decided to upgrade its backbone power lines to smart systems. In the most advanced areas, on-line assessments are made every two seconds to avoid power outages. When a system separation is detected, an independent system kicks in to enable a quick system recovery. As a result of these efforts, the number of hours of power outages and accidents per year is significantly lower in Japan than in the United Kingdom, the United States or France.

The third demand of electric systems is that they lower carbon dioxide emissions. Looking at electrical power generation by type, there has been a shift from oil to liquefied natural gas and nuclear power. To manage fluctuations in energy demand throughout the day, based on data from weather reports and social surveys, we prepare for peaks in demand ahead of time using pumped storage engines.

The fourth and last demand of electric systems is that they generate power for the regional society. In an electric project being undertaken in the northern region of Laos, as a buffer to a solar power transmission system, a small-scale pumped storage transmission system is also used to prepare and avoid in advance any troubles that may arise with the implementation of new energy. As noted by Mr. Takagi, in addition to managing backbone electrical systems, smart grids are able to manage internal smart grid systems, such as those inside commercial buildings.

According to Mr. Denda, with micro grids, recycled energy can be used to provide stable electric power transmission. Through gas engine transmission, battery, capacitor, natural energy and other micro grid control systems, output can be effectively controlled to provide a stable supply of electricity. In addition to stable supply, the system also provides a high quality of electricity. In a New Energy and Industrial Technology Development Organization (NEDO) project taking place in the Zhejiang Province of China, they are conducting trials assuming that half of the energy used for power transmission would be sourced from unstable solar energy. They are testing how electric companies can utilize micro grids to best provide a stable supply of electricity. Through such trials, Mr. Denda asserted that though it may be difficult to utilize recycled energy externally due to the balance with electricity distribution lines, within industrial facilities, smart grids can control the load of power generated inside buildings, thereby increasing the range of choices. In the future, smart grids will play many roles, including enabling the transmission of natural energy.

As both Mr. Takagi and Mr. Denda indicated, smart grids are very versatile. However, if you look at the world as a whole, who has benefited from this 20th century technological revolution called electricity? In reality, because of the way electrical transmission system networks are built, electricity is concentrated in metropolitan cities and advanced countries. How can we bridge this gap? Mr. Nagata pointed out that total system solutions hold the key, as we have seen with the opening of the global economy with the Internet and mobile telephones. The more we integrate unstable natural energy sources on the power generation side, the greater the burden we place on the existing power supply. To solve this problem, we need to choose between existing solutions or new solutions. In this case, Mr. Nagata proposed that for consumer-use electricity, where demand is more difficult to predict, ECO-networks are an effective solution. In other words, by bringing the power generation site and consumption site closer together and making up for any differences flexibly, we can overcome problems of electrical over and undersupply. Compared with one building, several buildings as a unit require less battery capacity, which would need less initial investment costs and be more reliable at the same time. In areas where there are no electrical transmission systems, this sort

of “adding on” process is helpful, as asserted by Mr. Nagata.

In this panel discussion, the focus of the talks was how the superior qualities of smart grids and other technologies can be integrated into the development of infrastructures throughout Asia. Mr. Takagi said that as seen by trials being conducted in New Mexico by the Economic Ministry and NEDO, numerous overseas trials can be an effective and important means toward standardization. Mr. Nagata echoed those thoughts saying that to build a consensus in this paradigm called Asia, we need to create the framework for standardization that incorporates existing technologies. Mr. Denda then pointed out that new technologies, such as micro grids, always have to overcome two different challenges – development and diffusion. He went on to say that technology must be effectively linked with the type of innovations taking place in society as a whole for them to become popularized and that it is important to provide the type of energies that are best suited to the particular region. Along similar lines, while new technologies, such as smart grids, have very practical potential if enough money is spent on them, discussion was lacking about what impact this would have on the price of electricity, an important aspect from the viewpoint of the consumer. Japan has many superior elemental technologies, such as smart grids. The question is how to get these adopted as global standards. As Mr. Takagi clearly pointed out, having these new technologies embraced in a growing Asia, in particular China, is vital in going global. Mr. Nishimura concluded that propagating smart grids based on economic return alone would be difficult on many fronts. In the future, creating an appropriate societal model would be an effective means in making smart grids and other superior Japanese elemental technologies a global standard.

＊＊＊＊＊