

1000kV Transmission Technologies

Conducted by the Tokyo Electric Power Company

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Abstract

The Tokyo Electric Power Company, Inc. (TEPCO) is the largest power company in Japan. The sales of electric power in fiscal year 2001 were 276billionkWh, which amounted to 33% of the total demand of Japan. The maximum peak demand 64.3GW was recorded in July 2001.

There are several characteristics of the power supply by TEPCO: First, the demand is concentrated in Metropolitan Tokyo, and extremely good-quality electricity is now demanded as the result of the development and spread of computers. Secondly, the location of sites for power station must be found in areas remote from the overcrowded metropolitan district.

The power demand has more than doubled in the last 20 years. Since the middle of 1970's TEPCO has made efforts to expand the 500kV network but it is very difficult to secure multiple power transmission routes in Japan. And the countermeasures of the short circuit capacity problem would be required in the course of the increase of 500kV transmission lines. Because of the above reasons, it was decided to construct 1000kV transmission lines having a capacity 3 to 4 times greater than that of 500kV transmission lines.

TEPCO completed the 1000kV transmission route that links the nuclear power station on the Sea of Japan to the metropolitan region and the other route linking power sources on the Pacific Ocean by 1999. These transmission lines are now operated at 500kV and they will be upgraded to 1000kV in the middle of 2010's.

The insulation coordination throughout the transmission line and substation by using surge arresters is essential in the 1000kV system design. As for the construction of 1000kV transmission line, the problem of corona discharge causing audible noise and radio interference has been solved by the eight-conductor bundle method and the tower weight has been reduced by developing the high-tensile steel materials. On the other hand, it is necessary to make facilities as compact as possible because 1000kV substations will be constructed in the mountains areas, where dimensional limits for transportation as well as harmonization with the environment must be considered. In addition, efforts were needed to establish various technologies that consist with Japan's unique environmental conditions such as earthquakes, salt contamination. Accordingly, various verification tests have been carried out since 1995.

In this paper, we will introduce the 1000kV transmission technologies such as 1000kV system design, construction of transmission lines and the field tests of substation equipment.