

Preventive Technology against Lightning Damage



Background

Lightning is a main cause of faults in electric power systems. Lightning is also a main cause of damage and malfunction in information and telecommunication systems and home electronics, as these sophisticated apparatus have become popular items in the advanced society under information and communication technologies.

CRIEPI has carried out a wide range of studies such as observation of lightning phenomena, test of lightning surge, and analysis of lightning surge phenomena. CRIEPI has also studied the preventive measures against lightning damage.

Principal results

To have a detailed knowledge of the characteristics of lightning phenomena is essential to prevent lightning damage. CRIEPI has developed various automatic observation systems for lightning phenomena (Fig.1), and elucidated the lightning characteristics in many local areas of Japan with other institutions including the electric power utilities.

Furthermore, for preventing lightning damage, CRIEPI has conducted both experimental and theoretical studies (Fig.2), and proposed preventive measures and verified them. The effectiveness of these preventive measures for the electric power systems is compiled in three guidebooks for lightning-proof design (Fig.3).

Future Developments

CRIEPI will engage in advanced studies for protecting the energy-generating facilities using natural resources such as wind, as well as computer systems, information and communication systems and control systems, from lightning damages. Moreover, CRIEPI will propose the lightning-proof design of higher effectiveness at lower costs.



Fig. 1. An example of observed result of winter lightning stroke

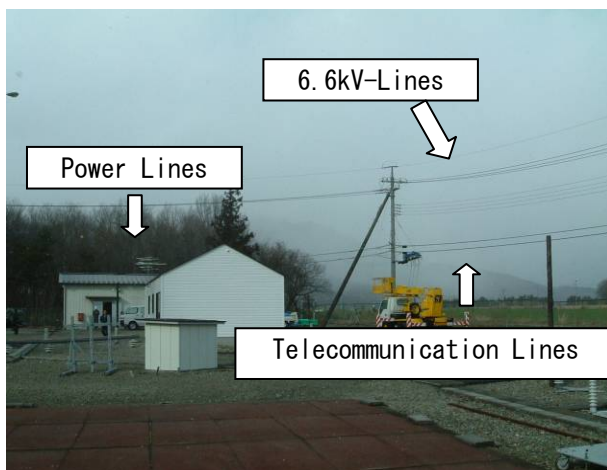
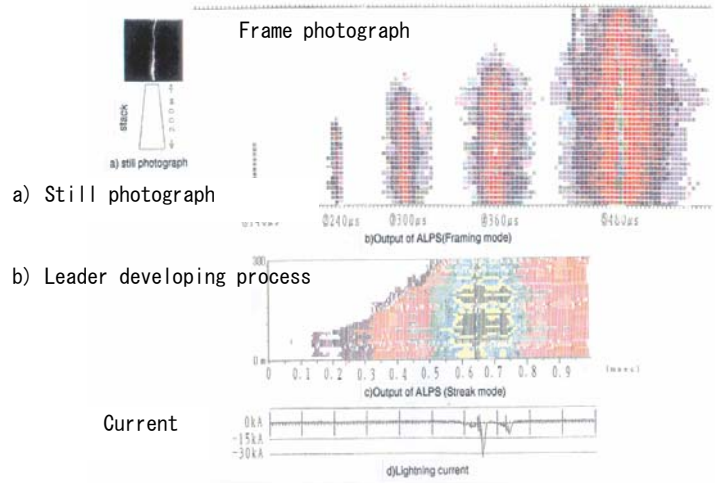


Fig. 2. Test facilities of low voltage control circuit

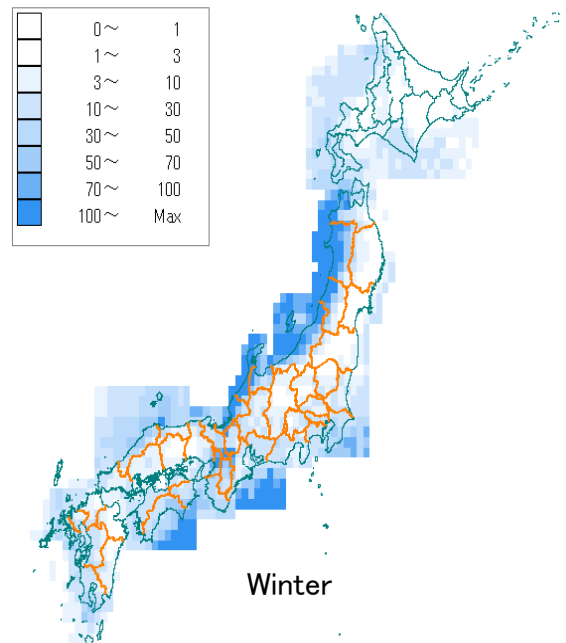
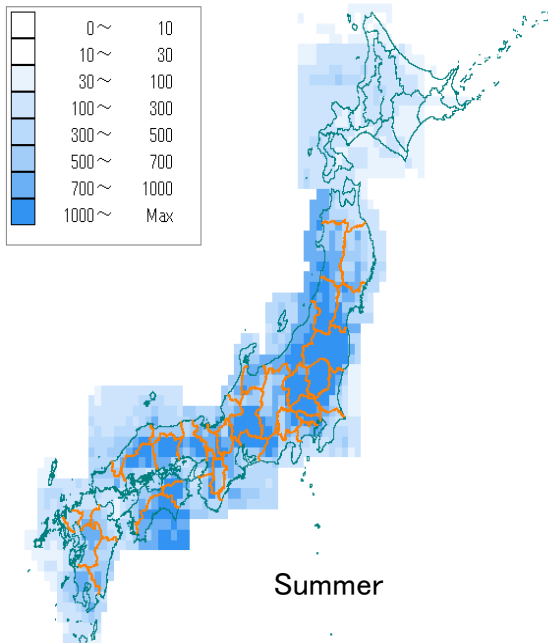


Fig. 3. Lightning protection design guides for electric power systems

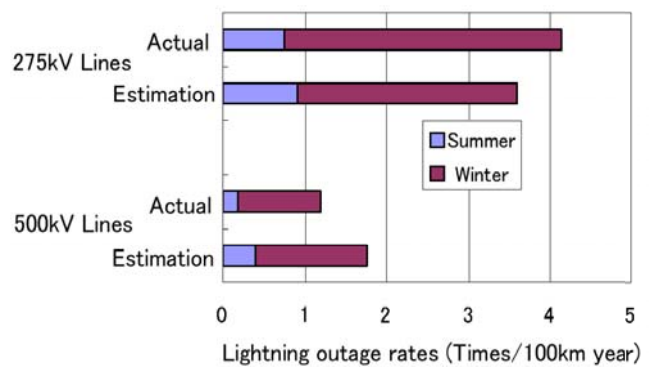
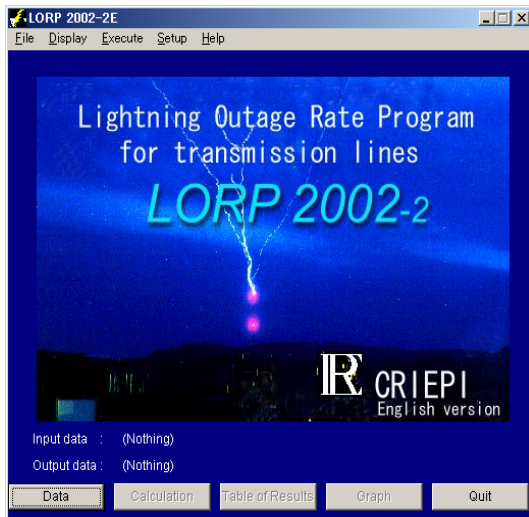
Our research activities of lightning preventive technologies



ALPS and observed results of upward leader
(ALPS: Automatic Lightning-discharge Progressing-feature observation System)



Lightning density map obtained from lightning location system (Times/year)



Program for estimation of Lightning outage rates on transmission lines