NAME : Masaki SHIRAI, Saki TARUISHI, Mikio SHIMIZU
COUNTRY : Japan
REGISTRATION NUMBER : 6504
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Devices installed for bird protection in Japan

Introduction

Bird collisions with overhead power lines are of global concern. Various devices (i.e., bird flight diverters: BFDs) intended to warn birds of overhead lines have been used to reduce the collision risk. However, these devices can overload or cause line deterioration. Consequently, transmission system operators (TSOs) face trade-offs between bird conservation efforts and infrastructure management.

Japan experiences climate extremes: heavy snowfall in the north and seasonal typhoons in the south. These conditions pose a challenge for the use of BFDs in overhead lines. Therefore, Japanese TSOs try to resolve the trade-offs by coloring the accessories of transmission facilities to account for snow and wind loads and placing relatively small BFDs at close intervals.

Characteristics of bird flight diverters (BFDs) in Japan

In Japan, several BFDs are used by TSOs to improve the visibility of overhead lines, including red or yellow snow-resistant rings, which are commonly used as anti-ice devices. The ground wires and/or electrical conductors used by TSOs have been marked using four types of BFDs.

Ring-type diverters are red- or yellow-colored snow-resistant rings attached to overhead ground wires and electrical conductors to improve birds' visibility. Rings (5 mm thick and 10 mm wide) attached to the wires at regular intervals prevent snow from rotating and landing on the wires. "Tag-type" diverters consist of a plastic plate and a common plastic plate 10 cm long and approximately 4.5 cm wide. They hang from a cable using snow-resistant rings and can swing back and forth. Spiral rods (2.6 mm in diameter), usually used to wrap aluminum wire in a vine shape around electric wires as a wind noise countermeasure, were colored red or yellow to improve the visibility of overhead ground lines (i.e., "spiral-type"). The ball-type diverter consists of an aluminum ball measuring 20 cm in diameter.

Of the BFDs in Japan, the ring and tag types were fixed to ground wires or electrical conductors every 0.3–1.0 and 1.0–1.5 m, respectively. Generally, BFDs in North America, Europe, and South Africa are designed to make the appearance of the line approximately 20 cm thicker over a length of 10–20 cm. The interval between diverters is often 5–20 m outside of Japan, which tends to be longer than that in Japan. Therefore, it can be noted that smaller BFDs are installed at relatively short intervals in Japanese transmission facilities.

Novel challenges and future perspectives

Installing larger BFDs at shorter intervals improves the visual effect for birds but also increases the negative impact on the respective facility. The optimal intensity and spacing of BFDs should be evaluated with consideration for both collision mitigation and structural integrity. For example, there is an ongoing attempt to quantify the increase in wind load caused by various installations of BFDs. To date, the efficacy of BFDs has been strictly determined by collision events—that is, efficacy for birds. We suggest that modern approaches, such as simulation analyses, can take infrastructure integrity into account and thus inform regarding a more effective use of BFDs from multiple perspectives.