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Investigation into effectiveness of a downwire insulator and insulated bonding wire as mitigation measures for pole-top fires in woodpole structures

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ABSTRACT

Woodpole structures are widely used for overhead medium voltage (MV) distribution lines in South Africa. The problem is that wood burning, also known as pole-top fires, occurs on such structures, resulting in undesirable power outages, replacement costs and safety risks to humans and animals. The feasibility of a modified partially bonded woodpole structure with a small downwire insulator instead of the 500 mm gap along the wood in reducing the risk of pole-top fires and bird safety was investigated. Tests were conducted in a natural heavily polluted environment at the Koeberg Insulator Test Pollution Station (KIPTS), where several structures were erected and energised at 22 kV (phase-to-phase). Laboratory tests were also performed to confirm the findings obtained at KIPTS. The downwire insulators have been proven to effectively conduct leakage current to earth under polluted and wet conditions, with very little current flowing through the woodpole. Furthermore, no tracking and/or burning was observed on the woodpoles of all the test structures. The findings are promising and indicate that a downwire insulator may be effective in reducing the risk of pole-top fires. The downfall is that the impedance of the downwire insulators and insulation levels provided by the downwire insulators under such conditions may not be adequate to ensure acceptably low risk of bird electrocution. It may be feasible to design such an insulator that only conducts leakage current when necessary to prevent pole-top fires, while maintaining sufficiently high impedance to prevent bird electrocution. The preliminary specifications of the new downwire are provided.