

Giacomo Cicconi, "Analysis of the Grounding System of Wind Turbines in View of Lightning Protection", 2014.

Abstract

Wind power is one of the fastest growing electric power generation sectors. Wind turbines (WT) are vulnerable to lightning which can cause important damages to wind turbine components. The design of lightning protection of modern wind turbines represents a challenging problem. Indeed, modern wind power generation units are characterized by ever taller turbines and it is expected that they will be more exposed to lightning strikes in the future. Furthermore, the presence of composite materials will affect the efficiency of the lightning protection system and should therefore be taken into account.

Lightning current flowing through the grounding system can result in a potential difference between the basement of the mast and incoming power conductor from a nearby substation or WT. This effect can be very significant depending on the tower grounding impedance characteristic. Induced voltage may result in overvoltage and malfunctions of power equipment and insulation.

In this project, the transient impedance of the grounding system of a wind turbine installed in Mont-Crosin was determined by experimental measurements. A transient model for the grounding extending to frequencies of up to a few MHz (frequency spectrum of lightning current) was developed. The issue of multiple grounding and the effect of the presence of the tower on the measured impedance are analyzed.