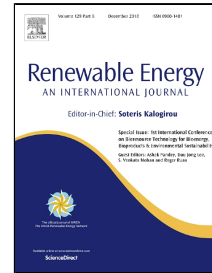


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Transient Modelling of the Wind Farms in order to Analysis the Lightning Related Overvoltages

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Abstract- During transient analysis of lightning surge, the distributed stray capacitances on wind turbine structure and the grounding system of tower have a considerable effect on the generated overvoltages that must be included in the calculation. Therefore, the accurate modeling of wind farms is vital. This paper presents the wide-band modeling of the wind farm so that different parts of the structure and frequency-dependent behavior of the grounding system are modeled. Also, a case study is implemented in the EMTP-RV in order to analyze the effects of the proposed method on the calculated overvoltages. The results show that the wide-band modeling of the wind farms results in the lower estimation of the overvoltages than to the previous methods with the difference that is more pronounced in the soil of high resistivity. Among different components of the structure, the proposed model has the most effect on the estimation of the ground potential. Furthermore, the arrester lifetime estimated by the proposed method is bigger than to the previous methods, in which the difference decreases with the ground flash density increasing. The presented method would be beneficial when designing lightning protection scheme and select optimal rating of the arresters for the intended wind farms.

Keywords- Wind turbine, Transient analysis, Wide-band modeling, lightning surge, EMTP-RV.

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