Modeling of the overhead power line cable deflections with measurement data accounted for

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Evaluation of clearance of the overhead power lines will be presented. The work was motivated by the need for the permanent control of this clearance in order to enable the maximum but safe electric current transmission. A hybrid modeling of the problem was proposed. It is based on both the knowledge of the overhead power line structure behavior, and on the on-line measurements of cable slope and temperature as well as the wind characteristics. The measured parameters may be monitored at selected places of cables and accounted for in the hybrid numerical modeling by one of two approaches.

A new mathematical model of cable behavior was applied [1]. The model is based on large 3D displacements, small and only tensile strains, negligible bending stiffness, finite tensile stiffness, constant equivalent cable cross-section, a thermo-elastic constitutive relation as well as the cable interaction with strings of insulators and elastic towers. Various mathematical formulations of the problem (strong and weak for both the Bubnov and the local Petrov-Galerkin discretization). Moreover, two solution approximation approaches were examined, namely the finite element method (FEM) as well as the meshless finite difference method (MFDM), both with the higher order shape functions.

The results of the numerical analysis were compared with in-situ measurements showing a satisfactory agreement. This research was supported by the NCBiR and The National Fund for Environmental Protection and Water Management (NFOSiGW) under grant NCBiR/214108.

[1] W.Cecot,S.Milewski,J .Orkisz, Determination of overhead power line cables configuration by the FEM and meshless FDM, *International Journal of Computational Methods*, DOI:10.1142/S0219876218500044 (20 pages),2018