

Design of a telescopic wind turbine with reduced environmental impact



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Energy production systems

Concept

A prototype of a telescopic pole for wind energy production with low environmental impact and its lifting system for a 60-250kW turbine and a height of 30 metres will be designed and manufactured. A telescopic tower, which is raised and lowered by automation or by remote control, allows differentiation of the presence of the generator within the landscape over time. The main drawback of wind farms is their significant environmental impact, mainly in terms of landscape alteration. The discomfort generated by wind farms is worsened by the persistence of the facilities even during periods of time when the demand for electricity is absent or the benefit from the production is less than the social cost of the environmental factors.

Scientific approach

An important line of research and industrial development is therefore the creation and production of wind power plants that have a lower environmental impact during the rest period. This can be done with the use of a tower which can be lifted and lowered easily and with high frequency. The currently available technology for the lifting and the lower of the wind turbines is given only by tipper masts in the mini-turbines sector and by hydropneumatics telescopic masts in the micro-turbines sector.

Three types of pole-lifting system will be developed: 1) pulley system, 2) hydraulic system and 3) electric system. All three systems will be reproduced and tested in the laboratory following numerical experimentation carried out through finite element method stress computational analysis.

Research objectives

The objective of the research is the choice of the best pile configuration depending on the boundary conditions such as: dynamic action caused by earthquake and wind, foundation type and associated construction costs. This will lead to the selection of the best configuration for the site where the pole is to be installed, but at the same time lay the foundation for the creation of a system independent of site-specific conditions.



Wind turbine stationary with lowered pole – picture from PERIMA 1 project



Wind turbine stationary with raised pole (a), detail of the lifting system (b) – picture from PERIMA 1 project