Improving power performance assessment by measuring at different heights has been demonstrated using ground-based profiling LIDARs. More recently, nacelle-mounted lidars studies have shown promising capabilities to assess power performance. Using nacelle lidars avoids the erection of expensive meteorology masts, especially offshore. A new generation of commercially developed profiling nacelle lidars has sophisticated measurement capabilities.

As for any other measuring system, lidars measurements have uncertainties. Their estimation is the ultimate goal of a calibration. Field calibration procedures have been developed for non-profiling nacelle lidars. However, their specificity to one type of lidar or another highlights the need for developing generic calibration procedures. Such procedures should be applicable to any type of existing and upcoming lidar technology.

Profiling nacelle lidars, either scanning or featuring a multiple number of beams, measure parameters such as wind speed and direction, shear, veer, etc. The wind parameters are reconstructed combining line-of-sight velocity measurements – also called radial wind speed. In the generic calibration procedure, the radial wind speed is calibrated rather than a reconstructed parameter.

This contribution presents a generic methodology to calibrate profiling nacelle-mounted lidars. The application of profiling lidars to wind turbine power performance and corresponding need for calibration procedures is introduced in relation to metrological standards. Further, two different calibration procedure concepts are described along with their strengths and weaknesses. The main steps of the generic methodology are then explained and illustrated by calibration results from two types of profiling lidars. Finally, measurement uncertainty assessment methodologies are explored and the corresponding results discussed.