Bend-twist coupling of wind turbine blades reduces the structural loads of the turbine but it also results in a decrease of the annual energy production. The main part of the power loss can be mitigated by pretwisting the blade, but some power loss remains and previous studies indicate that it might be related to the dynamic response of bend-twist coupled blades in turbulent flow. This paper contains estimations of the power curve from nonlinear time simulations, a linear frequency domain based method and a normal distribution weighted average method. It is shown that the frequency domain based estimation is highly dependent on the validity of the linearized model, thus estimations are poor for operational points close to rated wind speed. The weighted average method gives good results if an appropriate standard deviation is known a priori. The nonlinear time simulations show that changes in power due to turbulence are similar for coupled and uncoupled blades. Power gains at low wind speeds are related to the curvature of the steady state power curve. Losses around rated wind speed are caused by the effects of controller switching between partial and full power operation.

General information
Publication status: Published
Organisations: Department of Wind Energy, Wind turbine loads & control
Contributors: Ståblein, A., Hansen, M. H.
Number of pages: 10
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Journal of Physics: Conference Series (Online)
Volume: 753
Article number: 042018
ISSN (Print): 1742-6596
Ratings:
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.45 SJR 0.24 SNIP 0.401
Web of Science (2016): Indexed yes
Original language: English
Electronic versions:
Effect_of_Turbulence_on_Power_for_Bend_Twist_Coupled_Blades_Torque_.pdf
DOIs:
10.1088/1742-6596/753/4/042018
Source: PublicationPreSubmission
Source-ID: 126571153
Research output: Contribution to journal → Conference article – Annual report year: 2016 → Research → peer-review