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## **Magnetic Forces and Vibrations in Wind Power Generators**

Offshore wind energy will play a vital role in future world energy markets specially in US, UK and North Europe. There are a lot of challenges in developing offshore wind installations requiring strong R&D activities. One of the most important challenges in offshore installations is mechanical forces acting on wind turbine structures due to wind and also ocean waves. In addition, difficulties in access to the wind turbines and maintenance problems must be considered.

Direct-driven permanent magnet generators can reduce maintenance and increase system reliability in offshore installations by eliminating the gearbox. Direct-driven generators have a large diameter and short stator length and therefore moderate mechanical stiffness. This problem is very important especially in offshore applications, when large units are preferable.

The focus of this research work is on how to reduce the magnetic forces and vibrations in direct-driven permanent magnet generators. The magnetic flux in the airgap of the electrical machines contains harmonics and sub harmonics producing the magnetic forces and in special cases may cause critical vibrations in the generator. The main aim of this project is mitigation of magnetic vibrations in generator. The work will focus on winding arrangements and rotor and stator geometry in the design procedure.