UNIVERSITÄT PADERBORN
Die Universität der Informationsgesellschaft

FAKULTÄT FÜR
ELEKTROTECHNIK,
INFORMATIK UND
MATHEMATIK

Abstract of the dissertation:

Feed-in behaviour of Offshore wind farms
A Model for Analysis the input fluctuations of spacious distributed Offshore wind farms

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The great dependence of industrial nations on a safe, economic and environmentally compatible energy supply is nowadays becoming increasingly evident. There is a need for concepts enabling an efficient combination of ensured supply with acceptable energy prices and effective protection of the global climate. With this aim it has been agreed in the year 2007 under the German EU council presidency in the European energy council, that the European Union pledges a committed independent obligation to promote renewable energy sources by 20 % relative to the reference year of 1990 during the period until the year 2020. To achieve this goal on the electricity sector, all member countries with a coastline are thereby encouraged to exploit their enormous potential for Offshore wind energy utilisation. The German Federal Government plans an installation of about 25 GW Offshore wind energy capacity in the German territorial waters. For the integration of Offshore wind energy into the conventional grid system the knowledge of supply characteristics is vitally important.

The installed capacity of a single Offshore wind farm equates the capacity of a conventional generating unit. Considering a complete Offshore wind farm, the compact placement of the individual wind generator units can lead to their interaction. Usually some of the generator units are operating in a windstream already influenced by the units located upstream. Their momentary power output is reduced depending on the wind direction and the wind speed. The reciprocal interaction is much more distinct in a large Offshore wind farm. Therefore in order to describe the behaviour of the feed-in fluctuations realistically, a non-aggregated consideration of the wind farm is necessary.

In the dissertation, a model for analysis of the input fluctuations based on the wake effects behind every single turbine in a wind farm is presented. The interaction of the wakes and combined effects on units located upstream are considered. The measuring data of different German Offshore wind metmasts are used as input data for the model. Based on the measuring data the input fluctuations of spacious distributed Offshore wind farms could be compared to each other with the objective of detecting possible compensation effects in the feed-in behaviour.