AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
ELECTRICAL POWER AND MACHINS DEPT.

OFFSHORE WIND TURBINE ENERGY GENERATION

A Thesis
Submitted in Partial Fulfillment of the Requirement for the
Degree of Master of Science in Electrical Engineering

By

Mohamed Ahmed Mahmoud Samy Ahmed

Supervised by

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Cairo 2012

Ain Shams University –Faculty of Engineering
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توليد الطاقة من توربينات الرياح البحرية

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STATEMENT

This Thesis is submitted to Ain Shams University for the degree of Master in Electrical Engineering.

The work included in this thesis was carried out by the author. No part of this thesis has been submitted for a degree or a qualification.

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ABSTRACT

Offshore wind energy is a renewable energy source that has great potential in energy markets worldwide as our current knowledge of offshore engineering technology makes it ready for implementation immediately. In this Thesis, Zayt Gulf region was chosen to be the focus of this research interest for establishment and construction of both offshore and onshore wind farms for its high potential wind speeds all over the year. New different proposal for wind farms in the newly introduced site Zayt Gulf in Egypt is suggested. Both size and site of wind farm units are to be selected based on maximizing the use of available wind gust as well as avoiding environmental problems such as bird migration pathways and noise. Technical and economic analysis shall be provided to base the comparison between the different alternative wind farms. The speed and power of wind characteristics of Zayt Gulf region have been modeled and analyzed. To avoid bird migration problem, it is suggested to use modified wind turbines in the proposed onshore wind farms. Two proposals of onshore wind farms are introduced in the new area chosen (Zayt Gulf region). Another proposal for offshore wind farm is introduced at 10km away from Zayt Gulf region which has privilege of being away from bird migration pathways, avoiding noise problem and having higher wind speeds. For the privileged wind characteristics in this site, it is concluded that the cost of energy production is much lower than the internationally recognized benchmark.

TABLE OF CONTENT

LIST OF TABLETS

	5,000kW wind turbines respectively
4.4	A calculated monthly energy pattern factor K_E at 10 m height and energy density available at 163.5 & 163 m heights for both Enercon E-126 7,500kW and REpower 5M 5,000kW wind turbines respectively
4.5	Annual total output energy and the cost/kWh for 120 MW and 80 MW wind farms at offshore Zayt Gulf region using Enercon E126 7,500kW and REpower 5M 5,000kW wind turbines respectively
4.6	calculated monthly energy pattern factor K_E at 10 m height and energy density available at 40 m and 44 m heights
4.7	A comparison between the predicted and the actual output power at different heights for both wind turbines
4.8	Annual total output energy and the cost/kWh for 69 MW wind farm at Zayt Gulf region using Gamesa G52-850kW and Vestas V-47 660kW wind turbines respectively
Chapter Five: A Proposed Offshore Wind Farm at Zayt Gulf, Egypt	
5.1	Mean monthly wind speeds measured at 10 m hub height 10km away from Zayt Gulf region inside Red Sea
5.2	A comparison between estimated and actual output power at 90 m and 135 m heights for Repower 5M 5,000kW and Enercon E-127 7,500kW wind turbines respectively
5.3	calculated monthly energy pattern factor K_E at 10 m height and energy density available at 90 m and 135 m heights
5.4	Scale factors for cost increases as a function of water depth and distance to coast
5.5	Annual total output energy and the cost/kWh for 120 MW and 80 MW wind farms at offshore Zayt Gulf region using Enercon E126 7,500kW and REpower 5M 5,000kW wind turbines respectively
Chapter Six: Zayt Gulf Wind Farms Assessment	
4.1.	Mean monthly wind speeds measured at 10 m hub height at Onshore Zayt gulf region
5.1.	Mean monthly wind speeds measured at 10 m hub height at Offshore Zayt gulf region inside red sea
4.5.	Annual total output energy and cost/kWh for 120 MW and 80 MW

	wind farms at onshore Zayt gulf region Enercon E126 7,500 KW and RE power 5M 5,000 kW wind turbines respectively
4.8.	Annual total output energy and cost/kWh for 69 MW wind farms at Zayt gulf region using Gamesa G52-850 kW and Vestas V-47 660 kW wind turbines respectively
5.4	Scale factors for cost increases as a function of water depth and distance to coast
5.5	Annual total output energy and cost/kWh for 120 MW and 80 MW wind farms at offshore Zayt gulf region Enercon E126 7,500 KW and RE power 5M 5,000 kW wind turbines respectively

LIST OF FIGURES