

**POWER QUALITY ISSUES IN PUTTALAM GRID
SUBSTATION DUE TO WIND POWER GENERATION:
A CASE STUDY**

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08/8304



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Degree of Master of Science

Department of Electrical Engineering

University of Moratuwa
Sri Lanka

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Dissertation submitted in partial fulfillment of the requirements for the
Degree Master of Science in Electrical Installations

Department of Electrical Engineering

University of Moratuwa
Sri Lanka

August 2013

Declaration

“I declare that this is my own work and this dissertation does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The above candidate has carried out research for the Masters Dissertation under my supervision.

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(Mr. Kusum Shanthi)

Signature of the supervisor

Date:

(Dr. K.T.M. Udayanga Hemapala)

Abstract

Wind power as a rule does not contribute to voltage in grids. Also, wind power very often is a source of voltage fluctuations and flicker. Furthermore, care must be taken to upkeep availability of networks more or less dependent on wind power by preventing the voltage from collapsing in conjunction with faults occurring in the grid.

The operation of wind turbines has an impact on the power quality of the connected grid. Depending on the grid configuration and the type of wind turbine used, different power quality problems may arise. All wind turbines have an uneven power production following the natural variations of the wind. If the wind turbine is operating at fixed-speed, the tower shadow and wind speed gradients will result in fluctuating power. The power fluctuations caused by the turbine may cause flicker disturbances.

In order to evaluate the significance of flicker, measurements and subsequent flicker calculations, must be performed. In the case of variable-speed wind turbines, one drawback is the injection of harmonic currents into the grid. Depending on the type of inverter used, different orders of harmonics are produced.

The objective of the research is to analyze the problem of voltage and current harmonics, transient behaviour, power fluctuation and reactive power consumption of Puttalam wind power generators.

This study will conduct a detail study and to identify the power quality issues due to integration of wind plants to Puttalam GSS.

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List of Abbreviations

Abbreviation	Description
CEB	Ceylon Electricity Board
MW	Mega Watt
kV	Kilo Volt
GSS	Grid Sub Station
Rpm	Rounds Per Minute
RMS	Root Mean Square
PWM	Pulse Width Modulation
AVR	Automatic Voltage Regulator
PSS	Power System Stabilizers
IEC	International Electrotechnical Commission
PCC	Point of Common Connection
THD	Total Harmonic Distortion
OLTC	On Load Tap Changer



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