



EVALUATING CONNECTING AL-MUKHA NEW WIND FARM TO YEMEN POWER SYSTEM

By

Eng. Majid Manea Manea Al-Barashi

A thesis submitted to the
Faculty of Engineering at Cairo University

In Partial Fulfillment of the
Requirements for the Degree of

MASTER OF SCIENCE

In

Electrical Power and Machines Engineering

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Summary :

This thesis presents modeling and impact analysis of Al-Mukha wind farm (MWF) on Yemen power system. Two simulation studies are carried out; the first is impact on thermal limits, voltage variations, and system stability, with an MWF aggregated model. The other is analyzing low-voltage ride through, harmonics and flicker impact using the detailed MWF layout. The results show that the lines loading and voltage variations are slightly reduced and the system stability will not be affected. Although MWF rides-through the grid fault, it contributes harmonics higher than the limits while the flicker levels are far below any limits.

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Dedication

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List of Symbols and Abbreviations

$C(\psi_k)$	Flicker coefficient
CHP	Combined heat and power
C_p	Power coefficient (aerodynamic efficiency)
d	Relative voltage change (%)
DFIG	Doubly-fed induction generator
DSL	Dynamic simulation language
HD(s)	Harmonic distortion(s)
HV	High voltage
IEC	International Electro-technical Commission
$k_f(\psi_k)$	Flicker step-factor
$k_u(\psi_k)$	Voltage change factor
LVRT	Low-voltage ride-through
MV	Medium voltage
MWF	Al-Mukha wind farm
N_{10}	Maximum number of switching operations in a 10-minutes period
N_{120}	Maximum number of switching operations in a 120-minutes period
N_{wt}	Number of WTGs at the PCC
PCC	Point of common coupling
PDF	Probability distribution function
PEC	Public Electricity Corporation
P_{lt_cont}	Long term flicker disturbance factor during continuous operation
P_{lt_sw}	Long term flicker disturbance factor due to switching actions
P_{st_cont}	Short term flicker disturbance factor during continuous operation
P_{st_sw}	Short term flicker disturbance factor due to switching actions
P_w	Wind turbine generator output power
PWM	Pulse-width modulation
SCR	Short circuit ratio