بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية
التوثيق الإلكتروني والميكروفيلم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

MONA MAGHRABY

Cairo University

ENHANCING DISTANCE PROTECTION OF LONG TRANSMISSION LINES COMPENSATED WITH TCSC AND CONNECTED WITH WIND POWER

By

Ahmed Abdel Rahman Mohamed Abdel Jawad

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

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Electrical Power Engineering Department

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Title of Thesis:

Enhancing Distance Protection of Long Transmission Lines Compensated with TCSC and Connected With Wind Power

Key Words:

Adaptive Settings, Distance Protection, Thyristor Controlled Series Compensation (TCSC), Transmission Line (TL), Wind Power.

Summary:

This thesis discusses the negative impacts of connecting wind farm based on Double Fed Induction Generator (DFIG) and Thyristor Controlled Series Compensation (TCSC) on the performance of distance protection for transmission lines. Wind speed fluctuations cause voltage level variations at local buses so the impedance seen by distance relay will fluctuate affecting significantly the distance relay trip boundaries. TCSC produces complicated impedance that negatively affects distance protection operation causing mal-operation such as under-reaching or over-reaching.

Besides, the thesis presents integrated algorithms for achieving proper distance relay operation including fault detection, classification and updating characteristics zones for relay tripping decision. To mitigate the negative effects of TCSC, wind power and fault resistance, the thesis has proposed a scheme to change adaptively the settings of the Mho distance protection by shifting the relay characteristics. For implementing the proposed relay, limited communication requirements are required; as one time value is transferred in one stage (fault detection stage), while limited RMS values, not instantaneous values, are transferred in the third stage and the remaining stages are dependent on local measurements.

The proposed scheme was tested extensively compared with conventional relay under different case studies including different fault locations, fault resistance, fault inception angle, different wind power penetration and different wind speed that show the accurate performance of proposed scheme especially at challenging cases where the faults occurring near the end of the first zone and also near to buses. Finally, by getting use of technical and economic benefits of the proposed scheme, it could be used for updating, improving, and refurbishing of the existing Mho distance relays.

DISCLAIMER

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references sections.

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Date: / / 2022

Signature:

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES