**A WAVELET BASED PROTECTION SCHEME FOR DISTRIBUTION NETWORKS WITH MULTIPLE DISTRIBUTED GENERATION**

A

PROJECT REPORT

**Submitted in Partial Fulfillment of the requirements of the award ofdegree of**

**BACHELOR OF TECHNOLOGY**

**IN**

**ELECTRICAL & ELECTRONICS ENGINEERING**

**Submitted**

**By**

**R.SUJANA (10F01A0298)**

**P.KARTHIK (11F05A0218)**

**M.AMARESHWAR RAO (10F01A0273)**

**P.RAJESH KUMAR (10F01A0290)**

***Under the esteemed guidance of***

**Mr. MAHMOOD SHAIK,** M.Tech

ASSISTANT PROFESSOR

****

**DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING**

**ST.ANN’S COLLEGE OF ENGINEERING & TECHNOLOGY**

**(Accredited by NBA & IE (I) & NAAC with “A” GRADE approved by AICTE,**

**New Delhi & AFFILIATED TO JNTU KAKINADA)**

**Nayunipalli, vetapalem, chirala.**

**2010-2014**

**ST.ANN’S COLLEGE OF ENGINEERING & TECHNOLOGY**

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

**2010-2014**



**CERTIFICATE**

This is to certify that the project work entitled “**A WAVELET BASED PROTECTION SCHEME FOR DISTRIBUTION NETWORKS WITH MULTIPLE DISTRIBUTED GENERATION**”,isa bonafide record carried out by Mr.……………………………………………………………..bearing RegdNo:**………………………** under my guidance and supervision, as apartial fulfillment for the award of Bachelor of Technology degree in the**ELECTRICAL & ELECTRONICSENGINEERING**of JNT University , Kakinada during the academic year 2010-2014.

Viva voice date:

Mr.MAHAMOOD SHAIK, M.Tech S.V.D .ANIL KUMARM.Tech **(Ph.D)**

**Project Guide Head of the Department**

**External Examiner**

**ACKNOWLEDGEMENT**

It gives me immense pleasure to express my gratitude to everyone who helped me in the successful completion of my project titled **“A WAVELET BASED PROTECTION SCHEME FOR DISTRIBUTION NETWORKS WITH MULTIPLE DISTRIBUTED GENERATION”.**

It is great pleasure that I acknowledge my sincere thanks and deep sense of gratitude to my guide **Mr.MAHMOOD SHAIK**,for his valuable guidance throughout the course of this work. No words will be adequate to quantify his support, inspiration and cooperation. His unflinching help, suggestions, directions and guidance have helped in smooth progress of the project work.

I express my sincere thanks to**Mr.S.V.D.ANIL KUMAR, M.Tech(PhD),** Associate Professor &Head, Department of Electrical and Electronics Engineering, for his indispensable encouragement to complete the thesis.

I wish to thank our respected principal **Dr.C.S.RAO,** St. Ann’s College Of Engineering & Technology, chirala for providing support and stimulating environment in which the project has been developed.

I take this opportunity to sincerely thank the **Teaching** and **Non-Teaching Staff** of Electrical and Electronics Engineering Department, for providing me the opportunity to work in and extending all possible facilities.

**PROJECT ASSOCIATES:**

**R.SUJANA (10F01A0298)**

**P.KARTHIK (11F05A0218)**

**M.AMARESHWAR RAO (10F01A0273)**

**P.RAJESH KUMAR (10F01A0290)**

**ABSTRACT**

Integration of Distributed Generation (DG) in distribution power system would affect the fault current level and therefore the relay settings. This paper presents a protection scheme based on Wavelet Transforms for the detection of faults with and without DGs. Faults are simulated at each bus and the fault currents are analyzed with Haar wavelet to obtain detail coefficients of single level decomposition. Fault indices are calculated based on d-coefficients and compared with threshold for detecting the fault. In this paper multiple DGs analysis is done The performance of the proposed protection scheme is tested by considering the variations in the location of the DG successfully.

**INDEX**

**Contents**

**Chapter1: INTRODUCTION pg.no**

* 1. About this document 2
  2. Transmission line parameters 2
  3. What is distribution generation? 4
  4. Types of distributed energy sources 5
  5. Problems of distributed generation in distribution systems 5

Chapter2**: LITERATURE SURVEY 10**

Chapter3: **WAVELET ANALYSIS**

3.1 Introduction 14

3.2 Wavelet theory 15

3.3 Types of wavelets 21

3.4 Wavelet decomposition 26

3.5 Wavelet applications 27

Chapter4: **power system protection**

4.1 Introduction 30

4.2 Types of feeders 31

4.3 Types of faults in powers system 35

4.4 Protection schemes in power system 36

Chapter 5: **Test system**

5.1 Tested system in the project 39

5.2 Basic data for Distribution system 40

5.3 Simulink diagram for tested system 41

5.4 Effect of size of Distribution system 42

5.5 Selection of threshold value 42

5.6 Flow chart of the project 43

Chapter 6: **Results achieved**

6.1 Fault index at different buses 44

6.2 Threshold values for phase A, B& C 54

6.3 Fault index of three phases at bus 4 55

6.4 Fault index of three phases at bus 9 56

6.5 Fault index of three phases at bus 12 57

6.6 Fault index for different DG’s and phases 58

Chapter 7: **Conclusion** 65

**Reference** 66

**LIST OF FIGURES**

**S.No Table.No Description Pg.No**

1. 3.2.3 Daubechies 4-tap wavelet 26

2. 3.3.1 Haar wavelet 29

3. 3.3.2. Decomposition of the signal by filters 31

4. 4.2.1 Radial type feeder 37

5. 4.2.2 Loop type feeder 38

6. 5.1 Test system 42

7. 5.3 Simulink diagram 44

8. 5.6 Flow chart 46

9. 6.1.1 Fault occur at bus 4 48

10. 6.1.2 Fault occur at bus 9 49

11. 6.1.3 Fault occur at bus 12 50

12. 6.2 Threshold values of phase a, b& c 51

13. 6.3 Fault index for 3 phase fault at bus 4 52

14. 6.4 Fault index for 3 phase fault at bus 9 53

15. 6.5 Fault index for 3 phase fault at bus 12 54

16. 6.6.1 Fault index at bus 4 for Ia 55

17. 6.6.1.2 Fault index at bus 4 for Ib 56

18. 6.6.1.3 Fault index at bus 4 for Ic 56

19. 6.6.2 Fault index at bus9 for Ia 57

20. 6.6.2.2 Fault index at bus9 for Ib 58

21. 6.6.2.3 Fault index at bus9 for Ic 58

22. 6.6.3 Fault index at bus12 for Ia 59

23. 6.6.3.2 Fault index at bus12 for Ib 60

24. 6.6.3.3 Fault index at bus12 for Ic 60

**TABLES**

**S.No Table.No Description Pg.No**

1. 5.2 Data for distribution system 41

2. 6.1.1 Fault current at bus-4 in phase- a 46

3. 6.1.2 Fault current at bus-4 in phase- b 47

4. 6.1.3 Fault current at bus-4 in phase- c 48

5. 6.1.4 Fault current at bus-9 in phase- a 49

6. 6.1.5 Fault current at bus-9 in phase- b 50

7. 6.1.6 Fault current at bus-9 in phase- c 51

8. 6.1.7 Fault current at bus-12 in phase- a 52

9. 6.1.8 Fault current at bus-12 in phase- b 53

10. 6.1.9 Fault current at bus-12 in phase- c 54