

الآية

قال تعالى:

﴿وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ
وَسَتُرَدُّونَ إِلَىٰ عَالِمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُمْ بِمَا كُنْتُمْ
تَعْمَلُونَ﴾

صدق الله العظيم

التوبة - الآية (105)

DEDICATION

To

Endless love

Our mothers

To

Men who teach me to be men

Our fathers

To

Our teachers & our colleagues

AKNOWLEDGMENT

First, we need to thank fully our god (Allah) that without his blessing this work will not complete.

Then all thank for our supervisor Ust Galal Abd alrahman to his patience with us and countless hours and valuable efforts to guide and advise us to complete the work in his fair way.

Lastly we need to thank our teachers in electrical and nuclear engineering school to their efforts in helping and support.

Abstract

The objective of this research is how to simulate connect a solar photovoltaic power plant to the grid. synchronization between photovoltaic power plant and the grid was maintaining by using three phase inverter to convert dc current produced from the solar modules to Ac current similar to grid utility in voltage and phase sequence

المستخلص

الهدف من هذا البحث هو محاكاة كيفية توصيل طاقة الخلايا الشمسية للشبكة، يتم حفظ التزامن بين طاقة الخلايا الشمسية وال شبكة

باستخدام مبدل الطاقة ثلاثي الأطوار لتحويل التيار المباشر الناتج من الخلايا الشمسية الي تيار متردد مشابه للشبكة في التردد والجهد و زاوية الوجه.

TABLE OF CONTENTS

| TITLE | | Page |
|---------------------------------------|----------------------|------|
| الاية | | I |
| DEDICATION | | II |
| ACKNOWLEDGEMENT | | III |
| ABSTRACT | | IV |
| مستخلص | | V |
| TABLE OF CONTENTS | | VI |
| LIST OF FIGURES | | VIII |
| LIST OF TABLES | | IX |
| LIST OF SYMBOLES | | X |
| LIST OF ABBREVIATION | | XII |
| CHAPTER ONE | | |
| INTRODUCTION | | |
| 1.1 | Problem Statement | 1 |
| 1.2 | Objectives | 1 |
| 1.3 | Methodology | 1 |
| 1.4 | Project Layout | 2 |
| CHAPTER TWO | | |
| BACKGROUND REVIEW | | |
| 2.1 | Solar Power System | 3 |
| 2.2 | Grid | 7 |
| 2.3 | Control | 9 |
| 2.3.1 | Frequency control | 11 |
| 2.4 | DC/DC Converter | 12 |
| 2.5 | DC/AC Converter | 14 |
| CHAPTER THREE | | |
| PHOTOVOLTIC SOLAR POWER SYSTEM | | |
| 3.1 | PV Panels | 18 |
| 3.1.1 | Module and Array | 20 |
| 3.1.2 | Peak Power Operation | 20 |

| | | |
|---------------------------------------|-----------------------------|----|
| 3.1.3 | The Array Holder | 21 |
| 3.2 | Power Inverter | 21 |
| 3.3 | Charge Controller | 24 |
| 3.4 | Battery Storage | 29 |
| 3.5 | DC Power | 31 |
| 3.6 | AC Power | 32 |
| CHAPTER FOUR | | |
| MODEL SIMULATION AND RESULTS | | |
| 4.1 | MATLAB | 33 |
| 4.2 | Model of PV Module | 34 |
| 4.3 | Model DC/DC Power Converter | 38 |
| 4.4 | Model DC/AC Power Inverter | 39 |
| CHAPTER FIVE | | |
| CONCLUSION AND RECOMMENDATIONS | | |
| 5.1 | Conclusions | 42 |
| 5.2 | Recommendations | 42 |
| REFERENCES | | 43 |

LIST OF FIGURES

| Figure | Title | Page |
|--------|--|------|
| 2.1 | Stand alone solar system | 4 |
| 2.2 | Grid connect solar syatem | 6 |
| 2.3 | Control of voltage | 10 |
| 2.4 | Circuit of DC/DC converter | 12 |
| 2.5 | Switched voltage wave form | 13 |
| 2.6 | Single phase bridge DC/AC inverter | 15 |
| 2.7 | Three phase inverter | 17 |
| 3.1 | Thin film mono crystalline multi crystalline | 20 |
| 3.2 | Three phase inverter | 24 |
| 3.3 | Front view of PV charge controller | 26 |
| 3.4 | Connect charge controller in solar system | 29 |
| 4.1 | Basic structure of grid connect PV system | 33 |
| 4.2 | Basic model of PV cell | 35 |
| 4.3 | SIMULINK circuit of PV cell | 36 |
| 4.4 | Relation between current and voltage | 37 |
| 4.5 | Relation between power and voltage | 37 |
| 4.6 | DC/DC converter | 38 |
| 4.7 | Output of DC/DC converter | 39 |
| 4.8 | DC/AC inverter | 40 |
| 4.9 | Output of DC/AC inverter | 40 |