

**ENERGY STORAGE UTILIZATION IN A STAND
ALONE DC AND AC MICROGRID USING
RENEWABLE ENERGY**

A PROJECT REPORT

Submitted by

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in partial fulfillment for the award of the degree

of

BACELOR OF ENGINEERING

in

ELECTRICAL AND ELECTRONICS ENGINEERING

T.J.S. ENGINEERING COLLEGE, PERUVOYAL

ANNA UNIVERSITY : CHENNAI 600 025



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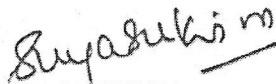
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Thiruvallur Dist - 601 206.

BONAFIDE CERTIFICATE

Certified that this project report "ENERGY STORAGE UTILIZATION IN A STAND ALONE DC AND AC MICROGRID USING RENEWABLE ENERGY" the bonafide work of the following students.

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who carried out the project work under my supervision.

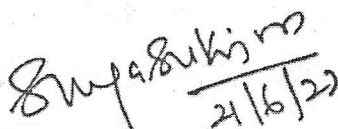

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Submitted for viva voice held on 21/6/22 at T.J.S. Engineering College,
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INTERNAL EXAMINER


EXTERNAL EXAMINER




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ABSTRACT

DC microgrids (dc MGs) are gaining popularity for photovoltaic (PV) applications as the demand for PV generation continues to grow exponentially. A hybrid control strategy for a PV and battery energy storage system (BESS) in a stand-alone dc MG is proposed in this project.

In contrast to the conventional control strategies that regulate the ~~dc-link voltage~~ only with the BESS, the proposed control strategy exploits both the PV system and the BESS to regulate the dc-link voltage.

The PV acts as the primary dc voltage regulator allowing for the battery to remain standby as a secondary dc voltage regulating resource. As a result, the proposed control strategy minimizes the utilization of the BESS in order to prolong its lifetime while maintaining the state-of-charge (SoC) of the battery within a desired range. To achieve that, the flexible power point tracking (FPPT) concept is applied to the PV system. To enhance the dynamic performance of the dcMG by adaptively adjusting the PV output power according to the load profile.



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RENEWABLE ENERGY SYSTEMS

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OBJECTIVES:

To impart knowledge on the following Topics

- Awareness about renewable Energy Sources and technologies.
- Adequate inputs on a variety of issues in harnessing renewable Energy.
- Recognize current and possible future role of renewable energy sources.

UNIT I RENEWABLE ENERGY (RE) SOURCES 9

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources.

UNIT II WIND ENERGY 9

Power in the Wind - Types of Wind Power Plants(WPPs)-Components of WPPs-Working of WPPs- Siting of WPPs-Grid integration issues of WPPs.

UNIT III SOLAR PV AND THERMAL SYSTEMS 9

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems : Basic Principle of SPV conversion - Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array ,PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.

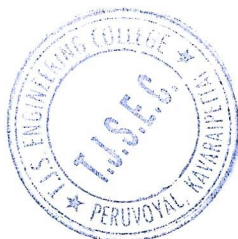
UNIT IV BIOMASS ENERGY 9

Introduction-Bio mass resources -Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system.

UNIT V OTHER ENERGY SOURCES 9

Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Hydrogen Production and Storage- Fuel cell : Principle of working- various types construction and applications. Energy Storage System- Hybrid Energy Systems.

TOTAL : 45 PERIODS



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OUTCOMES:

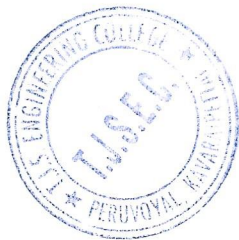
- Ability to create awareness about renewable Energy Sources and technologies.
- Ability to get adequate inputs on a variety of issues in harnessing renewable Energy.
- Ability to recognize current and possible future role of renewable energy sources.
- Ability to explain the various renewable energy resources and technologies and their applications.
- Ability to understand basics about biomass energy.
- Ability to acquire knowledge about solar energy.

TEXT BOOKS:

- 1 Joshua Earnest, Tore Wizeliu, 'Wind Power Plants and Project Development', PHI Learning Pvt.Ltd, New Delhi, 2011.
- 2 D.P.Kothari, K.C Singal, Rakesh Ranjan "Renewable Energy Sources and Emerging Technologies", PHI Learning Pvt.Ltd, New Delhi, 2013.
- 3 Scott Grinnell, "Renewable Energy & Sustainable Design", CENGAGE Learning, USA, 2016.

REFERENCES

1. A.K.Mukerjee and Nivedita Thakur," Photovoltaic Systems: Analysis and Design", PHI Learning Private Limited, New Delhi, 2011
2. Richard A. Dunlap," Sustainable Energy" Cengage Learning India Private Limited, Delhi, 2015.
3. Chetan Singh Solanki, " Solar Photovoltaics : Fundamentals, Technologies and Applications", PHI Learning Private Limited, New Delhi, 2011
4. Bradley A. Striebig,Adebayo A.Ogundipe and Maria Papadakis," Engineering Applications in Sustainable Design and Development", Cengage Learning India Private Limited, Delhi, 2016.
5. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
- 6 Shobh Nath Singh, 'Non-conventional Energy resources' Pearson Education ,2015.



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