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Improved PV Solar Power System Design with a Temperature-Related MPPT Controller

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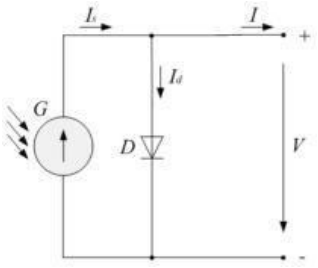
Abstract

Nowadays, the best alternative to fossil fuel-based power plants is solar PV power generation.The development of the aforementioned will undoubtedly lead to the retirement of thermal and nuclear power plants in the future.In comparison to other renewable energy sources currently available, it is rapidly developing globally, and the costs of production and installation are decreasing.This study compares an improved PV solar power system design with an MPPT controller to existing methods that coped with fluctuating sun irradiation, unprotected areas, and partial shadowing. Design stage and maintenance procedure will be aided by this for maintenance directors and designers.

INTRODUCTION

Renewable energy sources that are abundant in nature include sun, wind, and tidal power[1].These options exist today for the enormous power output.In the domain of power system di stribution, demand for PV generation systems is rising [2].The sun's irradiance is 1345 w/m2, but because of deflection, only 1000 w/m2 of it reaches the earth[3].The MPPT algorithm ad apts to variations in temperature and solar irradiation.Since installing the solar panels[4].

Ideal single diode equivalent circuit



The equations are

$I_d=I_o*[\exp(V_d/V_T)-1]$ (1)

$V_T=KT/q$ x nI x Ncell (2)

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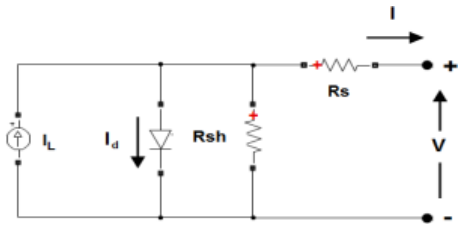
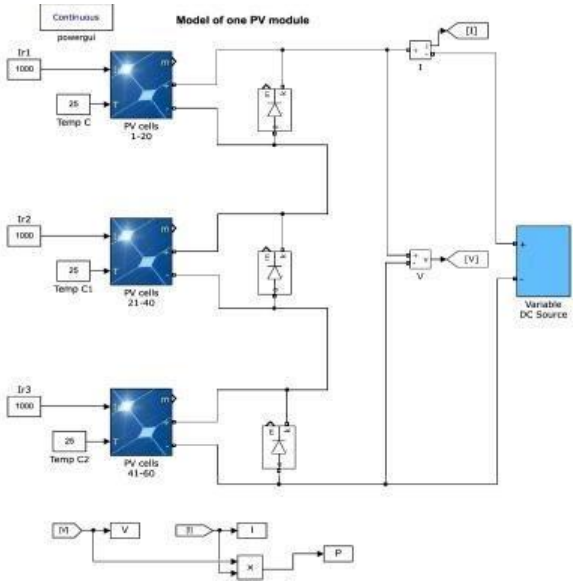
PRACTICAL SINGLE DIODE EQUIVALENT CIRCUIT

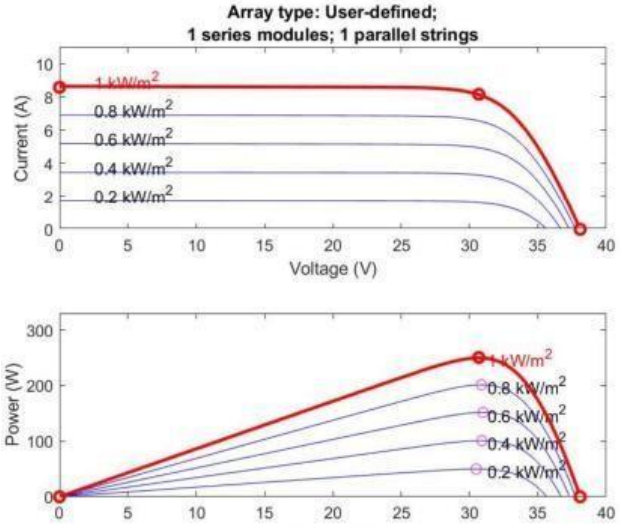


MODELLING OF PV CELL



RESULTS AND DISCUSSION

A. Observation I: I-V and P-V characteristics of PV cell under variable irradiance and constant temperature conditions.



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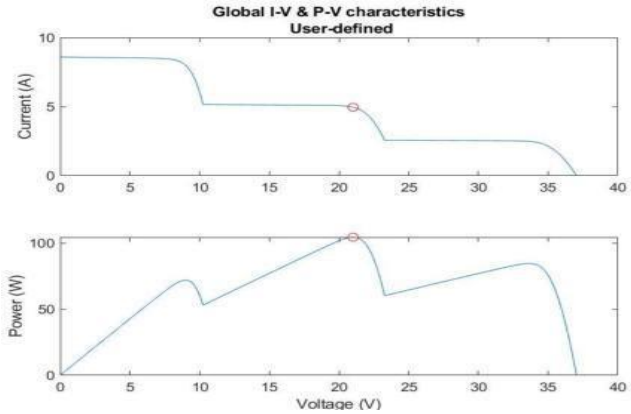
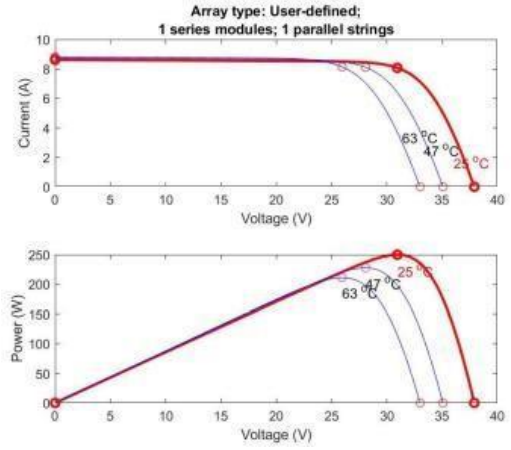
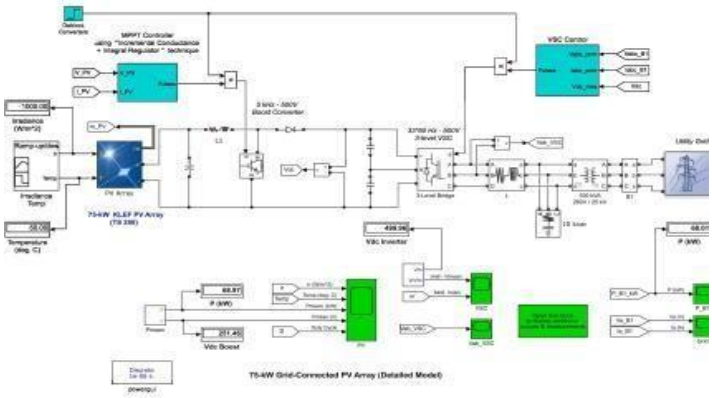
Observation II: Global characteristics of PV moduleunder partially shaded condition (figure -3 reference).



B. OBSERVATION III:PV CHARACTERISTICS UNDER DIFFERENT TEMPERATURES.



Observation IV:Power –time characteristics of MPPTmodel as a function of variable irradiance and variabletemperature (INC-CON algorithm+integral regulator



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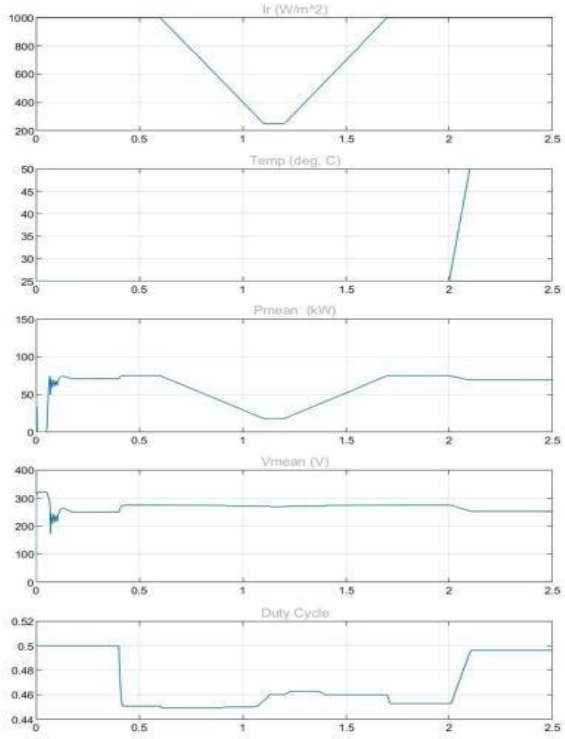
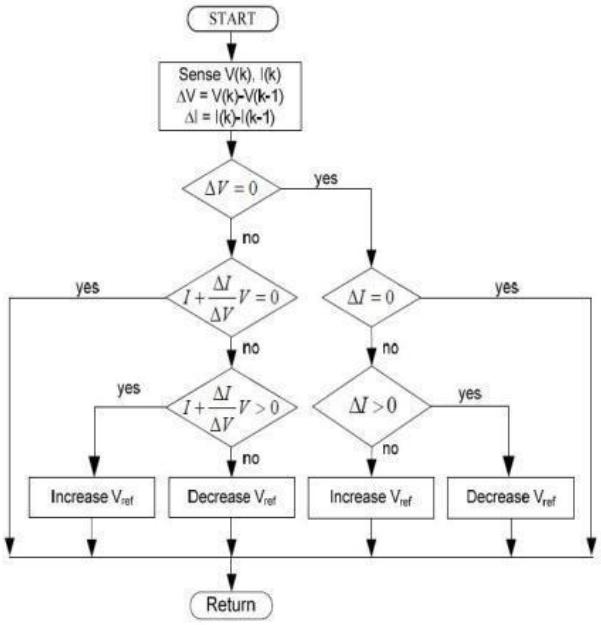
POWER-TIMECHARACTERISTICS AS A FUNCTION OFIRRADIANCE AND TEMPERATURE.



FLOW CHART



Flowchart for the Incremental Conductance method

KLEF Solar POWER System

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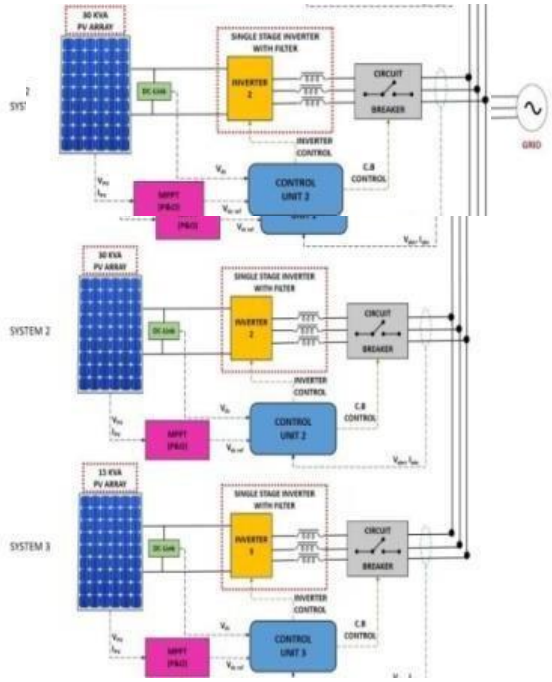
Block diagram of the overall system proposed



CONCLUSION

.Therefore, there is a clear goal for the future that includes generating 100% of the energy from solar panels, which is feasible. In addition, this adds to the environmental benefit of lowering greenhouse gas emissions.The lifespan of the solar array will be shortened by variations in the surrounding temperature.When choosing solar panels for applications, a wattage margin is typically chosen.Check the temperature and ambient temperature ratings of the location where it is installed to ensure that deration is addressed.Designers and maintenance professionals will profit from this.Second, the PV systems go dark, therefore with the improved design, extra units are supplied throughouttheday.

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