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Hybrid Power System Dynamic Modeling with MPPT for Fast Solar Radiation Variations

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Abstract

From the perspective of electrical energy systems, photovoltaic and wind energy systems are generally necessary. The idea of a hybrid grid energy system, which includes PV as well as other renewable energy sources like wind, fuel, and ultra-capacitor based systems, is also proposed in this study. In order to control the solar power, an incremental conductance-based MPPT technique is suggested in this study. By using a case study simulation, the effectiveness of the suggested system is shown by the performance of the hybrid system.

INTRODUCTION:

The majority of the world's current energy needs are met by fossil f uels like coal, oil, and natural gas[1], all of which are rapidly deple ting [2]. One of the most shocking consequences of a dangerous climate cha nge is that one of its prime contributors, carbon dioxide[3], is creat ing a stunning risk for life on our planet[4].

Configuration of proposed grid connected hybrid system[5]

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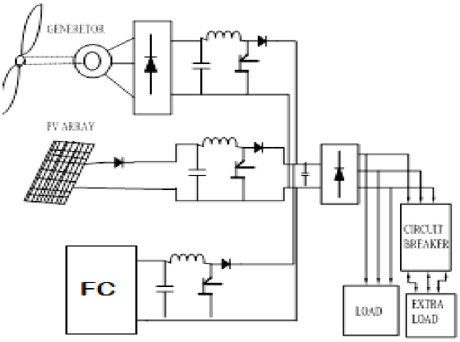
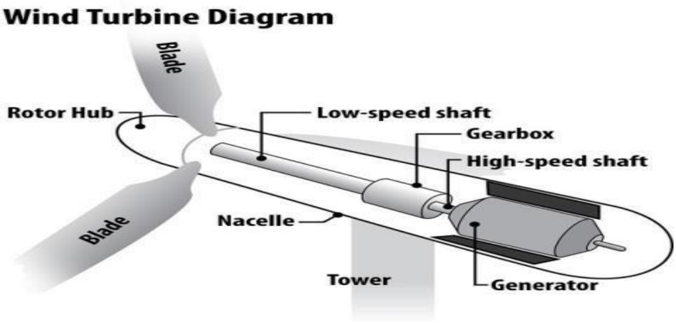
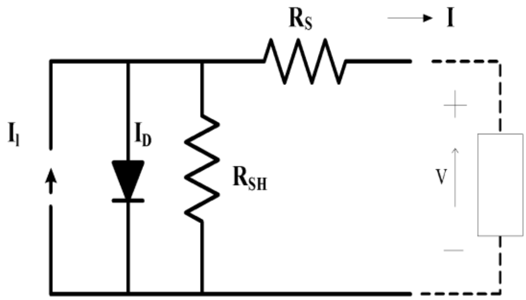


Wind Turbine



PHOTOVOLTAIC ARRAY MODELING:



Response of output characteristics of PV Array

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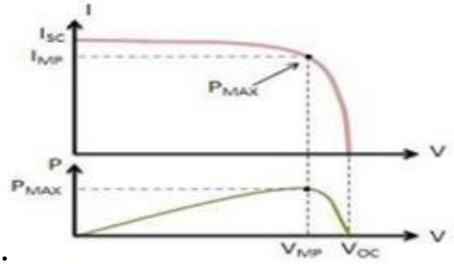
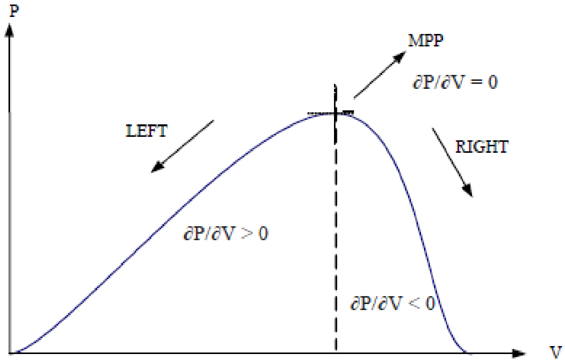


INC MPPT Technique:



Characteristics of PV Power Vs Voltage under INC method

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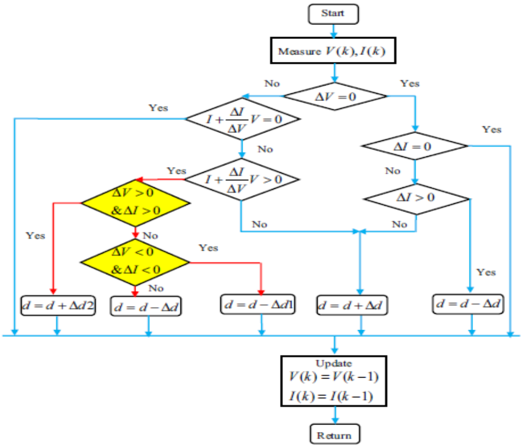
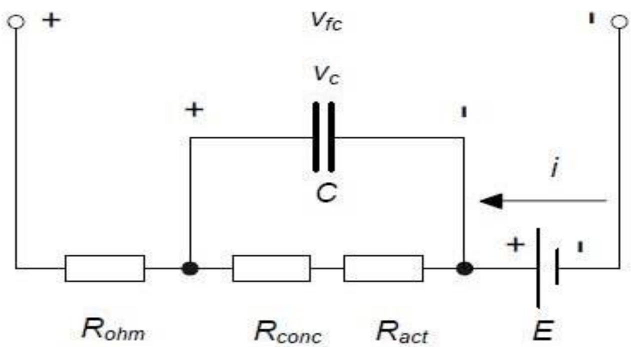


INC MPPT flow chart

Fuel Cell Equivalent Electric Circuit



Block Diagram for Electrolyzer

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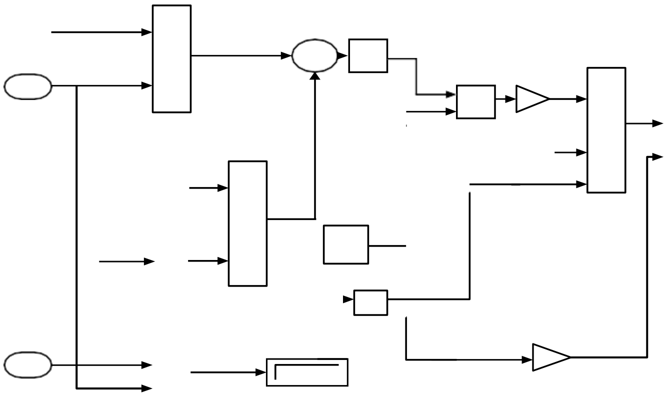
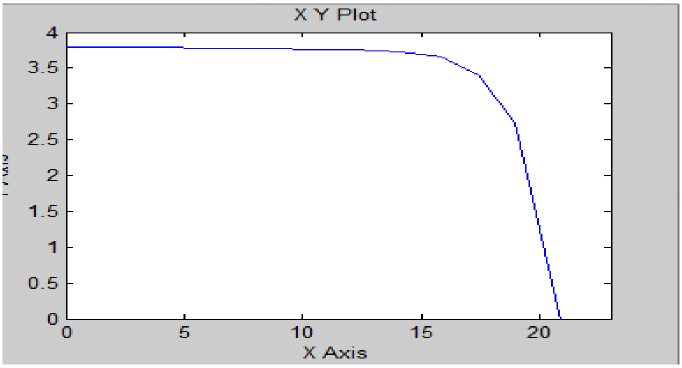


RESULTS AND DISCUSSION:

I-V GRAPH :



P-V Graph

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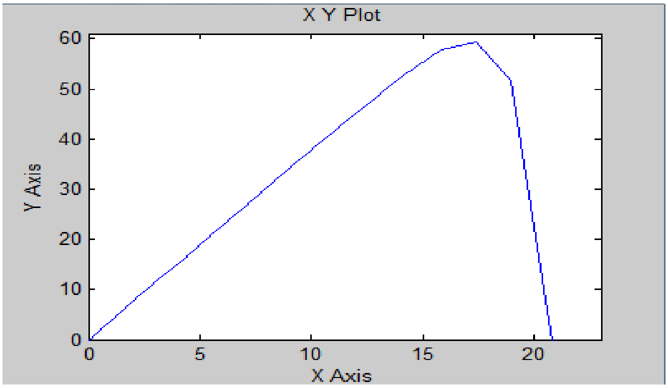
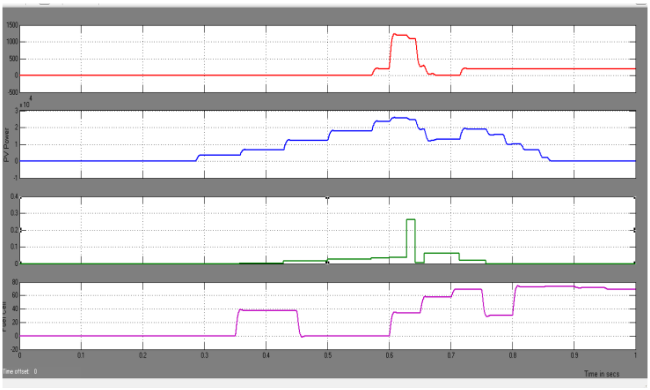
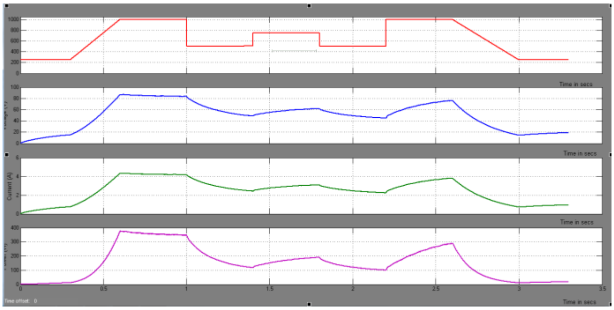


Hybrid Power System output powers (a) Wind Power (b) Solar Power, (c) Hydrogen (d) Fuel Cell Power





: With normal INC-Conductance Method(a) Irradiance, (b) Solar Voltage (c) Solar Current (d) Solar Power

CONCLUSION

In MATLAB PC situation, the suitability of disengaged power framewor ks is evaluated.

The system under consideration is flexible in order to match the load, wh ich is quite valuable for far-flung responsibilities.

It is observed that the suggested design requires little work and has fewer multifaceted qualities.

On the off chance that they are linked to the brace, the disconnected pow er systems will use the brace to provide their unmet power needs.

Overall, the implementation of a segregated framework is better and mor e financially advantageous to all clients, and it works remarkably well for provincial zones to meet distant burdens.

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CONCLUSION AND FUTURE SCOPE

The overview of the conclusions reached in each chapter is presented in this part. The thesis' principal conclusions are as follows: If one wants to pinpoint the precise maximum power point, modeling the behavior of PV array networks under the influence of shade is a challenging challenge.

To simulate the electrical behavior of PV array networks of "series parallel (SP), total cross-tied (TCT), bridge-link (BL), and honeycomb (HC)" sizes under non-uniform conditions, a model has been developed.

A skyscraper reconfigurable layout is suggested for the TCT array to better disperse nearby shade modules throughout the array.

On the other hand, the proposed skyscraper pattern struggles to provide a consistent shading distribution.It displays several peaks in i P V features

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as a result.It is suggested to use a new configuration controller based on genetic algorithm optimization to achieve uniform shade distribution und er "PSCs".In comparison to current reconfiguration strategies, the GA pr ovides an ideal connection matrix for a 66 TCT array that evenly distribu tes the shading effects throughout the array to preserve constant row-currents.The suggested method also reduces the "multipleipeakipoints" in iPV features.The TCTiarray's rowcurrent reduction is crucial under PSCs to boost output power and prevent numerous peaks.As several peaks are attenuated, the cost of the MPPT is decreased.The GA technique, on the other hand, converges more slowly due to its limited search spaceTo min imize row current disparities due to shading effects, an adaptiveireconfig uration architecture for the TCTiarray is developed. This topology autom atically connects adaptive partimodules to the fixed part.

The suggested method is an improvement over a traditional fixed PV syst em in terms of technology.

The power output of the suggested method was higher than that of a tradi tional PV array.

Additionally, by lowering row current difference, the suggested method mitigates many peak spots in P-V characteristics. •

To prove the superiority of each suggested solution, projections for electr icity savings and money production are also provided.

In contrast, the proposed approaches effectively create efficient electricit y under "partial shading conditions" and harvest the most output from the PV array.

FUTURE SCOPE

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The MATLAB-Simulink programming language is used in this work to build the suggested Skyscraper reconfigurable pattern for the TCT array.
Future study, however, may take into account adopting this pattern arrangement utilizing small-scale PV systems.
The GA approach is investigated in the current study to provide a consistent shade distribution for the 66 TCT array under PSCs.
However, PSO, Tabu search, Hill-climbing, and Antcolony optimization approaches can be used for additional research to achieve a uniform shade distribution.
The proposed adaptive topology is used to a 33 array in a smaller-scale PV system with shading.
However, my future work involves expanding this method to a 1010 array size with the use of less switching hardware so that it may operate in shaded and fault settings. Additionally, applying this adapt