WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

A Review for PV System Based on P&O MPPT Algorithm

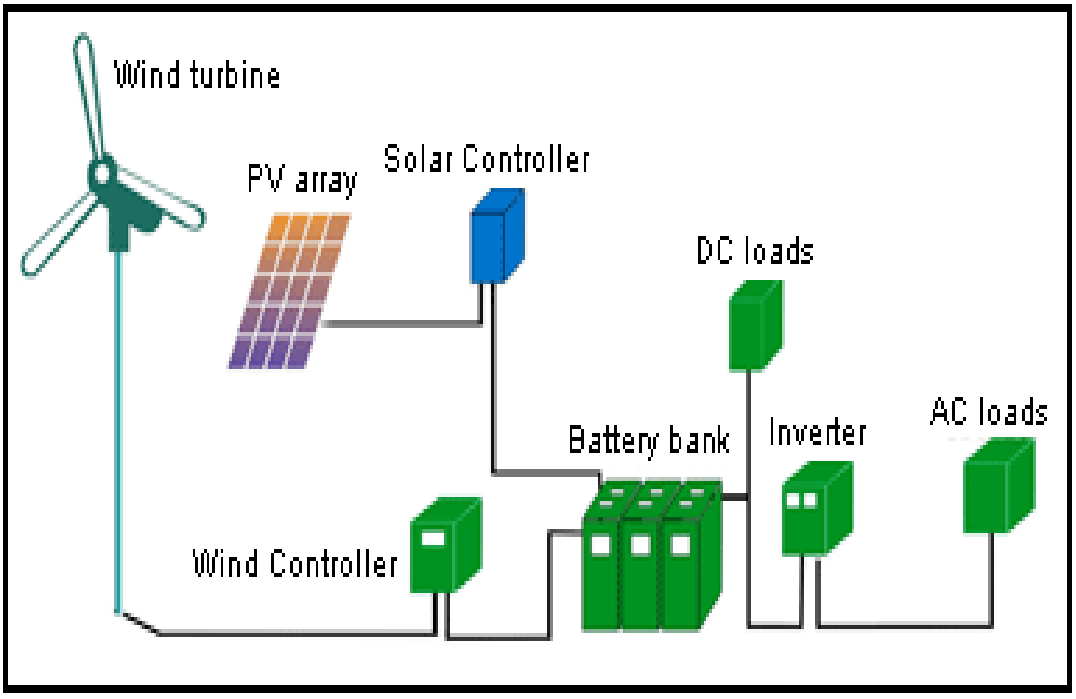
[1]Sandeep Saket, [2]Sachindra Kumar Verma

[1]Mtech scholar, Department of Electrical And Electronics Engineering, NRI Institute of Information Science And Technology
[2]Assistant professor, Department of Electrical And Electronics Engineering, NRI Institute of Information Science And Technology

1 INTRODUCTION

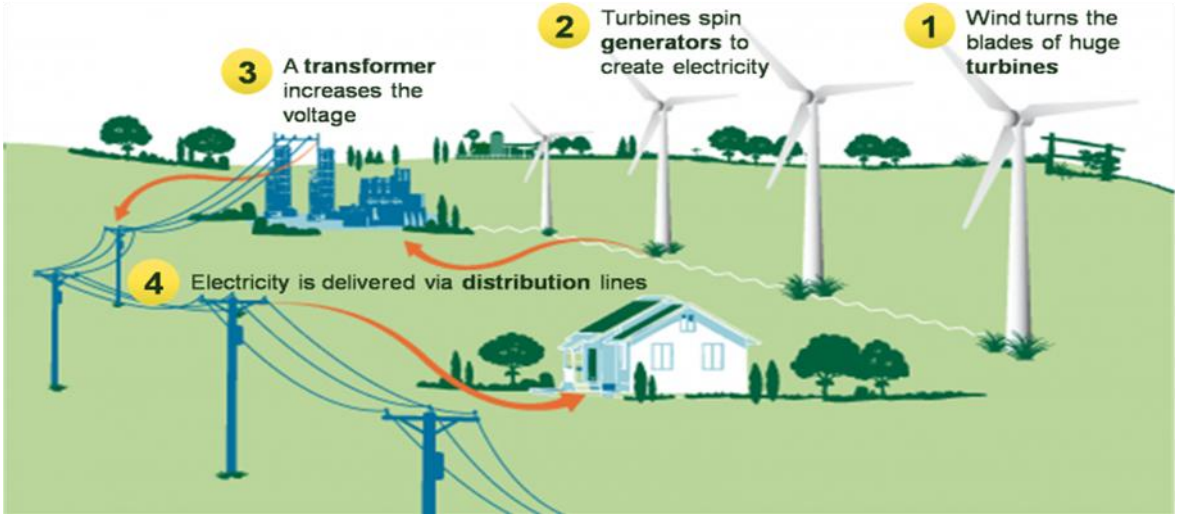
Electricity is required for day-to-day activities and output. The power system is divided into four parts: power generation, transmission, conversion, and consumption. It is difficult to set up transmission and transmission systems for minimal power demands on isolated farms, forest farms, and islands. In addition, hurricanes and other catastrophic occurrences will continue to wreak havoc on the grid. Global warming is a major worry, and switching to renewable energy as a source of energy is an effective approach to minimize fossil fuel emissions. As a result, it is vital to construct a renewable energy system independent of the grid for these reasons. One of the advantages of combining multiple power sources is that it can deliver long-term power in regions where conventional power systems cannot. They are useful in a variety of applications, however due to their non-linearity, hybrid energy systems have been proposed as a way to solve this problem and increase performance. To maximize production and energy management, hybridization entails mixing several energy and storage units in the same strategy. Wind solar hybrid systems use a combination of renewable energy sources, such as wind and solar, to generate electricity. Solar panels and small wind turbine generators are used to generate electricity in this setup.

Because wind and sun energy complement each other, the system can create electricity virtually all year round. Wind aero generator and tower, solar photovoltaic panels, batteries, cables, charge controller, and inverter are the major components of the Wind Solar Hybrid System. The Wind-Solar Hybrid System creates electricity that may be used to charge batteries and run AC appliances via an inverter. The wind aero-generator is mounted on a tower that is at least 18 meters above ground level. Because of its height, the aero-generator receives more wind at a faster speed, generating more power.



II. THE NEED FOR RENEWABLE ENERGY

Renewable energy is energy that is derived from natural resources such as the sun, wind, waves, or geothermal energy. These are renewable resources that can be recycled naturally. As a result, these sources of knowledge are regarded endless in comparison to the depletion of traditional fossil resources [1]. The worldwide power shortage gives clean or renewable energy a new drive to expand or mature. [2]. Aside from the global drop in fossil fuel transportation, another important reason fossil fuels aren't working is the pollution caused by burning them. In contrast, it is commonly known that renewable energy sources are cleaner than traditional energy sources, or that the energy produced has no negative effects on pollution



III. METHEDOLOGY

Standalone Photovoltaic System Components

3.1 Photovoltaic cell

A photovoltaic cell, also known as a photoelectric cell, is a semiconductor device that uses the photovoltaic effect to convert light into electrical energy. When the energy of a photon of light exceeds the band gap, an electron is emitted, and the flow of electrons produces current.

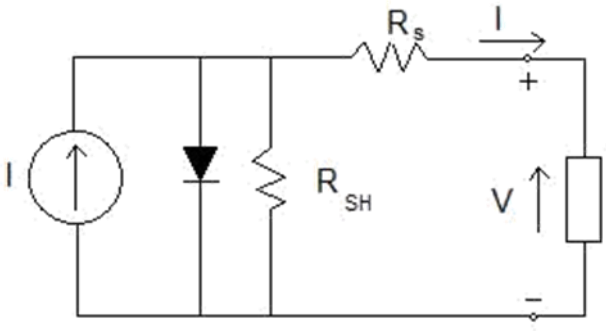
A photovoltaic cell, on the other hand, is not the same as a photodiode. A photovoltaic cell is constantly forward biased because light falls on the n-channel of the semiconductor junction and is turned into current or voltage signal.

.3.2 PV module

To meet energy demands, a number of PV modules are usually connected in series and parallel. Commercially available PV modules come in a variety of sizes (generally sized from 60W to 170W). A typical small-scale desalination unit, for example, demands a few thousand watts of power.

3.3 PV modelling

A solar array is made up of multiple photovoltaic cells connected in series and parallel. The parallel connection is responsible for raising the current in the array, whereas the series connection is responsible for increasing the voltage of the module. A current source and an inverted diode connected in parallel can be used to imitate a solar cell. It has its own resistance in series and parallel. The leakage current causes series resistance, whereas the impediment in the direction of electron transport from the n to the p junction causes parallel resistance.



In this model we consider a current source (I) along with a diode and series resistance (Rs). The shunt resistance (RSH) in parallel is very high, has a negligible effect and can be neglected.

The output current from the photovoltaic array is

I=Isc-Id ..(3.1)

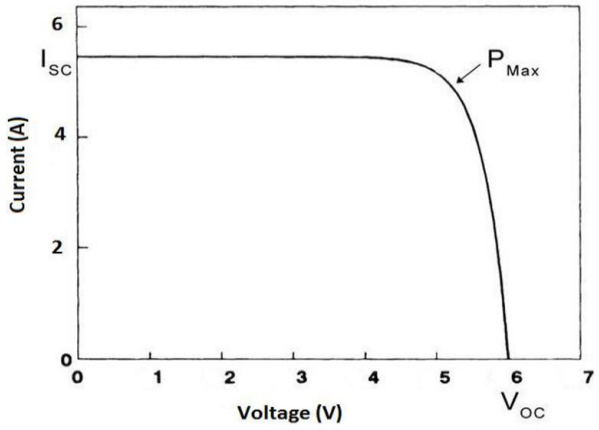
Id=I0(e^(q^(vd⁄kT))-1) ..(3.2)

where Io is the reverse saturation current of the diode, q is the electron charge, Vd is the voltage across the diode, k is Boltzmann constant (1.38 * 10-19 J/K) and T is the junction temperature in Kelvin (K)

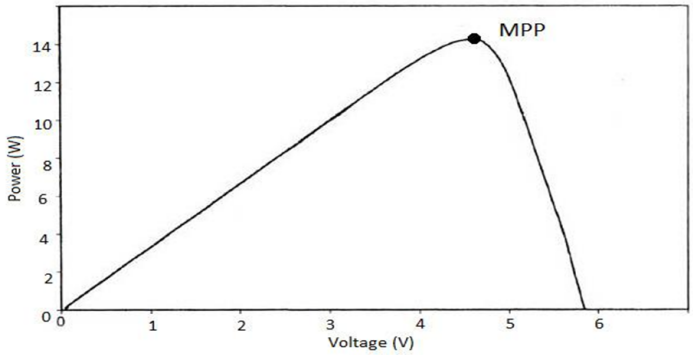
From eq. 3.1 and 3.2
I=Isc-I0(e(q(vd⁄kT))-1)

Using suitable approximations,
I = Isc – Io (eq((V+IRs)/nkT) - 1)

where, I is the photovoltaic cell current, V is the PV cell voltage, T is the temperature (in Kelvin) and n is the diode ideality factor.
In order to model the solar panel accurately we can use two diode model but in our project our scope of study is limited to the single diode model. Also, the shunt resistance is very high and can be neglected during the course of our study.



The I-V characteristics of a typical solar cell are as shown in the Figure 3.2.
When the voltage and the current characteristics are multiplied we get the P-V characteristics as shown in Figure 3.3. The point indicated as MPP is the point at which the panel power output is maximum.



3.4 Boost Converter As stated in the introduction, the maximum power point tracking is basically a load matching problem. In order to change the input resistance of the panel to match the load resistance (by varying the duty cycle), a DC to DC converter is required.

References:

1. Resource and Energy Economics - C Withagen - 1994 - Elsevier
2. SemanaScientífica - L Pedroni - 2004 - Google Book
3. Wind power in Power Systems (Book) - T Ackermann - 2005 - Wiley
4. Analysis of Wind Energy in the EU-25 - European Wind Energy Association - 2007
5. Solar Power (Book) - T Harko
6. Harnessing Solar Power (Book) - K Zweibel – 1990
7. REN21 Renewables 2010 Global Status Report
8. “How biomass energy works” - Union of Concerned Scientists
9. Geothermal Energy: Renewable Energy and the Environment - William E. Glassley - CRC Press - 2010
10. Impact of Enhanced Geothermal Systems (Egs) on the United States in the 21st Century: An Assessment - Tester, Jefferson W. et. al. - 2006
11. Advanced Algorithm for control of Photovoltaic systems - C. Liu, B. Wu and R. Cheung
12. A new Analog MPPT Technique: TEODI - N. Femia, G. Petrone, G. Spagnuolo, M. Vitelli

13. Comprehensive approach to modeling and simulation of Photovoltaic arrays - Marcelo GradellaVillavla, Jones Rafael Gazoli, Ernesto RuppertFilh
14. Power Electronics: Circuits, Devices and Operations (Book) - Muhammad H. Rashid
15. Comparison of Photovoltaic array maximum power point tracking technique - Patrick L Chapman, TrishanEsram Design and simulation of Photovoltaic water pumping system - Akihiro Oi
16. Reza IskharismaYuwanda;EkaPrasetyono;RachmaPrilianEviningsih Constant Power Generation Using Modified MPPT P&O to Overcome Overvoltage on Solar Power Plants 2020 International Seminar on Intelligent Technology and Its Applications (ISITIA) Year: 2020
17. Sadeq D. Al-Majidi;Maysam F. Abbod;Hamed S. Al-Raweshidy A Modified P&O-MPPT based on Pythagorean Theorem and CV-MPPT for PV Systems 2018 53rd International Universities Power Engineering Conference (UPEC) Year: 2018
18. DhaouadiGuiza;DjamelOunnas;YoucefSoufi;AbdelmalekBouden;MahmoudMaamri Implementation of Modified Perturb and Observe Based MPPT Algorithm for Photovoltaic System 2019 1st International Conference on Sustainable Renewable Energy Systems and Applications (ICSRESA) Year: 2019
19. SandipGuhaThakurtaSandipGuhaThakurtaA Modified MPPT Algorithm for Single Phase Grid Connected PV System 2020 National Conference on Emerging Trends on Sustainable Technology and Engineering Applications (NCETSTEA) Year: 2020
20. ChittaranjanPradhan;Manoj Kumar Senapati;Siva Ganesh Malla;Paresh Kumar Nayak;TerjeGjengedal Coordinated Power Management and Control of Standalone PV-Hybrid System With Modified IWO-Based MPPT IEEE Systems Journal Year: 2020
21. ElaheHeydari;AliYazdianVarjani Combined modified P&O algorithm with improved direct power control method applied to single-stage three-phase grid-connected PV system 2018 9th Annual Power Electronics, Drives Systems and Technologies Conference (PEDSTC) Year: 2018
22. Jagan Mohan Sahu;Saroj Kumar Mishra;SubhranshuSekharPati Modelling of Grid Integrated PV System using Modified MPPT Technique 2019 International Conference on Intelligent Computing and Control Systems (ICCS) Year: 2019
23. MadhavKumar;RanjuBharti;D.V. Siva Krishna Rao K. Conventional and Hybrid Perturb & Observe based Maximum Power Point Tracking for Solar System 2019 International Conference on Vision Towards Emerging Trends in Communication and Networking (ViTECoN) Year: 2019
24. Hatem Taha;R. M. Mostafa;UsamaAbouzayed;FawzyEltohamy Design and Implementation of PV MPPT Controller based on Modified P&O Algorithm using FPGA for Satellite Systems 2018 13th International Conference on Computer Engineering and Systems (ICCES) Year: 2018
25. YagyadattaGoswami;K. P. S. Rana;Vineet Kumar Performance Analysis of an Improved Variable Step-Size IC MPPT Technique for SPV System 2021 International Conference on Computing, Communication, and Intelligent Systems (ICCCIS) Year: 2021
26. Mohamed H. Osman;Mamdouh K. Ahmed;AhmedRefaat;Nikolay V. KorovkinA Comparative Study of MPPT for PV System Based on Modified Perturbation & Observation Method 2021 IEEE Conference of Russian Young Researchers in Electrical and Electronic Engineering (ElConRus) Year: 2021
27. NieLi;MaoMingxuan;WanYihao;CuiLichuang;ZhouLin;ZhangQianjin Maximum Power Point Tracking Control Based on Modified ABC Algorithm for Shaded PV System 2019 AEIT International Conference of Electrical and Electronic Technologies for Automotive (AEIT AUTOMOTIVE) Year: 2019