

Modeling and Simulation of Grid Connected Hybrid Power System Integrated with Solar PV/Wind and Controlled by Voltage Regulator

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Abstract: *This study investigates the growing attention towards non-conventional sources of energy due to the increase in prices of conventional energy sources. The focus of this research is on a hybrid solar-wind energy system that is connected to the grid. The hybrid system incorporates both wind and solar sources, along with AC loads. In the solar component, the DC output is enhanced using a boost converter, while the maximum power point tracking (MPPT) technique is employed to optimize the solar system's output. The wind subsystem consists of a permanent magnet synchronous generator, rectifier, and boost converter to maximize the wind energy output. A voltage regulator is utilized to control the hybrid solar-wind system. The modeling of the hybrid PV (photovoltaic) and wind turbine, which is regulated by the voltage regulator, is explained. The aim is to enhance reliability and reduce reliance on a single energy source by combining these two systems. The Solar-Wind hybrid power system described in this study effectively harnesses renewable energy from the sun and wind to generate electricity. The system control primarily relies on a microcontroller, ensuring the optimal utilization of resources and improving efficiency compared to individual modes of generation. Additionally, it increases reliability and decreases dependence on a single energy source. This hybrid solar-wind power generation system is suitable for both industrial and domestic applications. To ensure the originality of the content, it is essential to conduct a thorough literature review and properly cite any referenced sources.*

Keywords: hybrid solar-wind energy system, grid-connected, wind, solar, AC loads, boost converter, MPPT technique, permanent magnet synchronous generator, rectifier, voltage regulator, etc

REFERENCES

- [1] J. Godson, M. Karthick, "Solar PV-Wind hybrid power generations system" Vol. 2, Issue 11, November 2013.
- [2] Dr. Swapnil B. Mohod, Vikramsingh R. Parihar, "Hybrid Power System with Integration of Wind Battery and Solar PV System" 978-1-5386-0814-2/17/2017 IEEE.
- [3] Anjali Rana, Mohammad Ilyas "Implementation of WIND/PV Hybrid system using matlab" IJAREEIE Vol. 4, 10-15662 Issue 7, July 2015.
- [4] Mubashar Yaqoob Zargar, Mairaj-ud-din Mufti, "Modelling and control of wind solar hybrid system using energy storage" 978-1-5090-1666-2/16/2016 IEEE.
- [5] Prachi P. Chintawar, M.R. Bachwad, "Power quality improvement Wind/PV hybrid system by using facts device" vol 4 issue 6, June 2015.
- [6] N. Mendalek and K. Al-Haddad "Photovoltaic System Modeling and Simulation" vol 2. 978-1-5320-9 2017 IEEE.
- [7] Oladimeji Ibrahim, Nor Zahir Yahaya, Bandar Seri Iskandar " Matlab/Simulink Model of Solar PV Array with Perturb and Observe MPPT for Maximising PV Array Efficiency" vol 3 issue Dec IEEE 2015.
- [8] Mukesh Kumar, Mohit Kachhwaya, Bhavnesh Kumar " Development of MATLAB/Simulink based model of PV System with MPPT" 978-1-5090-4530-2016 IEEE.
- [9] Rim ben ali, Horst schulte, Abdelkader mami "modeling and simulation of a small wind turbine system based on pmsg generator" in Evolving and Adaptive Intelligent Systems 978-1-5090-6444-1/17/\$31.00 ©2017 IEEE

- [10] Raghuvendra Kumar Tiwari, Krishna Kant Sharma” Simulation and Modeling of Wind Turbine using PMSG” In International Journal of Recent Research 2016.
- [11] Ahmed Chaib,Djalloul Achour,Mohamed Kesraoui,”Control of a Solar PV/Wwind hybrid energy system”, international scientific conference “Enviromental and climate Technologies”14-16 october 2015.
- [12] Prajapati bhavna, Vaishali y. Patel, Madhusudan v. Gohil “simulation of a solar-wecs hybrid renewable energy conversion system using matlab/simulink” International Journal For Technological Research In Engineering Volume 2, Issue 8, April-2015..
- [13] Neha Adhikari, Bhim Singh, A. L. Vyas, Ambrish Chandra, Kamal-Al-Haddad, “Analysis, Design and Control of a Standalone HybridRenewable Energy Conversion System” IEEE.
- [14] Qi Zhiyuan, “Coordinated Control for Independent WindSolarHybrid Power System” vol 7,978-1-4577- 0547-2/12/2012 june IEEE.
- [15] Partha Sarothi Sikder, Nitai Pal,” Modeling of an intelligent battery controller for standalone solar-wind hybrid distributed generation system 1018-3639/ 2019
- [16] B.Kanagasakthivel ,Dr. D. Devaraj “Simulation and performance anyasis of solar PV-wind hybrid energy system using Matlab/Simulink” 978-1-4799-7633-2,2015 IEEE.
- [17] Abeer A. M. EI-Hany,Shawky H.Arafa, Maged N.F.Nashed, “modeling and simulation for hybrid of PVWind system.” In international Journal of Engineering Research volume No 4, issue No 4, pp: 178-183