Simulation and Control of Solar Wind Hybrid Renewable Power System

ABSTRACT:
The sun and wind based generation are well thoroughly considered to be alternate source of green power generation which can mitigate the power demand issues. This paper introduces a standalone hybrid power generation system consisting of solar and permanent magnet synchronous generator (PMSG) wind power sources and a AC load. A supervisory control unit, designed to execute maximum power point tracking (MPPT), is introduced to maximize the simultaneous energy harvesting from overall power generation under different climatic conditions. Two contingencies are considered and categorized according to the power generation from each energy source, and the load requirement. In PV system Perturb & Observe (P&O) algorithm is used as control logic for the Maximum Power Point Tracking (MPPT) controller and Hill Climb Search (HCS) algorithm is used as MPPT control logic for the Wind power system in order to maximizing the power generated. The Fuzzy logic control scheme of the inverter is intended to keep the load voltage and frequency of the AC supply at constant level regardless of progress in natural conditions and burden. A Simulink model of the proposed Hybrid system with the MPPT controlled Boost converters and Voltage regulated Inverter for stand-alone application is developed in MATLAB.

KEYWORDS:
1. Renewable energy
2. Solar
3. PMSG Wind
4. Fuzzy controller
5. P&O

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SOFTWARE: MATLAB/SIMULINK

BLOCK DIAGRAM:

Figure 1. Block diagram of PV-Wind hybrid system

EXPECTED SIMULATION RESULTS:

Figure 2. PV changing irradiation level

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Figure 3. Output voltage for PV changing irradiation level

Figure 4. Wind speed changing level

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Case 1: PI voltage regulated inverter

Figure 5. Output current wind

Figure 6. Output Voltage wind
Case 2: fuzzy logic voltage regulated inverter

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Figure 9. Output voltage for inverter

Figure 10. Power generation of the hybrid system under varying wind speed and irradiation

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CONCLUSION:

Nature has provided ample opportunities to mankind to make best use of its resources and still maintain its beauty. In this context, the proposed hybrid PV-wind system provides an elegant integration of the wind turbine and solar PV to extract optimum energy from the two sources. It yields a compact converter system, while incurring reduced cost.

The proposed scheme of wind–solar hybrid system considerably improves the performance of the WECS in terms of enhanced generation capability. The solar PV augmentation of appropriate capacity with minimum battery storage facility provides solution for power generation issues during low wind speed situations.

FLC voltage regulated inverter is more power efficiency and reliable compared to the PI voltage regulated inverter, in this context FLC improve the effect of the MPPT algorithm in the power generation system of which sources solar and wind power generation systems.

REFERENCES:


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