Novel approach of Battery SOS with PV optimization by particle swarm optimization

Gagandeep Kaur[1], Mr. Gaurav[2]
Research Scholar[1], Assistant Professor[2]
Shaheed Udham Singh College of Engineering and Technology Tangori, Mohali, India[1,2]

Abstract - In this paper a new stochastic-heuristic methodology for the optimization of the electrical supply of stand-alone (off-grid) hybrid systems (photovoltaic-wind-diesel with battery storage) is shown. The objective is to minimize the net present cost of the system. The stochastic optimization is developed by means of Monte Carlo simulation, which takes into account the uncertainties of irradiation, temperature, wind speed and load (correlated Gaussian random variables), using their probability density functions and the variance-covariance matrix. Management of load by particle swarm optimization.

Keywords - *PSO, Fuzzy, simulation, PV, wind*

I. INTROCUTION

Distributed generation, likewise approached dispersed generation, site generation, decentralized generation, installed generation, distributed energy or decentralized energy produces electricity from numerous small energy sources. Currently, modern nations produce the greater part of their electricity in substantially together brought offices, for example, hydropower plants or fossil fuel (coal and gas powered) atomic. These plants have superb scale economies, yet for the most part transmit long electricity separations and influence nature contrarily [1]. Most plants are manufactured thusly due to different financial, wellbeing and security, computed, characteristic, land and topographical components. For instance, coal power plants are collected a long way from urban groups to shield their considerable air contamination from influencing the majority [2]. In like manner, such plants are oftentimes worked close collieries to confine the cost of transporting coal. Hydroelectric plants are by their inclination confined to working at regions with satisfactory water stream. Most power plants are frequently thought to be too far away for their waste warmth to be used for warming structures. Low contamination is a key good position of joined cycle plants that devour vaporous petroleum. The low contamination enables the plants to be adequately near a city to be used for region warming and cooling [3]. Distributed generation is another approach. It diminishes the way of measuring vitality lost in transmitting power in light of the way in which that the ability is delivered incredibly close where it's used, possibly in an equivalent. This in like manner diminishes the size and amount of} power lines that must definitely that really must be produced. Average distributed power sources in a Feed-in Tariff (FIT) plot have low upkeep, low contamination and high efficiencies. Beforehand, these characteristics required dedicated working creators and enormous complex plants to decrease contamination. Whatever the case, introduce day installed frameworks may give these qualities mechanized operation and renewables, for example sunshine, wind and geothermal. This diminishes the way of measuring power plant that may show an advantage [4].

II. LITERATURE REVIEW

Soares, Tiago, et al. [5] introduces the concept of Distribution system operators for active distribution grid management. DSO is based on operational planning approach which activates the flexibility in resources. This method also uses multi-period AC-OPF, and gives a reliable solution for DSO. The uncertainty of PV and Wind is based on spatial-temporal trajectories and convex hull is used to define the sets of model that are used. DSO method enhanced the reliability in the real-time operation. Badawy, et al. [6] in this paper, the author proposed optimal power flow technique of PV– battery powered fast EV station and reduced the cost of operation. This method helps in fast EV charging in PV systems. In this method prediction layer is used as a particle swarm optimization in first stage and in second stage dynamic programming is performed by using online reactive management layer. This method improves the computation time and efficiency. Ghaddar, et al. [7] the author solved the polynomial optimization problem in alternating current optimal power flow. This method is used as a 2 degree polynomial program and solving them by using convexification. In first degree valid inequality is added to non-convex quadratic program. Sparse variant of Lasserre's hierarchy is used to explore the structure of polynomial program. Duan, Jie, et al. [8] solved the problem of data integrity attack in distributed optimal power flow. In this paper the author proposed the resilient distributed DC-OPF algorithm to control the attack. It verifies the correctness of the shared information from neighbor buses while preserving the privacy. It identifies the distributed controllers which are compromised and recover the optimal power dispatch results. The case study shows the effectiveness of the proposed method. Hosseinzadeh, et al. [9] Proposed the robust optimal PMS for hybrid ac/dc microgrid. In this work mainly

considered factors is maximum utilization of renewable resources, minimum usage of fuel based generators and extended battery lifetime. The uncertainty in resources results in fluctuations in the dc bus voltage and two-level controller is used to control the charge and discharge battery power. Madani, et al. [10] studied the potential of SDP relaxation of OPF over mesh networks. In this author firstly considers the weak cyclic network with three network cycle. The voltage line difference is used for line modeling. This work also shows the computational complexity of the OPF that is related to the topology of the power network. Ranking method is applied for all the solution available on the network.

III. PROPOSED METHODOLOGY

Displaying of the PV-Wind hybrid system is completed utilizing MATLAB Simulink. The Solar-Wind Hybrid Power System (SWHPS) comprises of a few units, PV power and wind power units as essential energy sources, battery bank unit as helper energy source, dc-air conditioning and dc-dc converters, control and load unit. The capacity of controller unit is to guarantee the power administration, which is conveyed by the hybrid system to fulfill the load request and to charge the battery. The capacity of dc-dc converter is to change over the unregulated DC voltage to deliver controlled voltage. The inverter unit is utilized to change over the DC produced power from renewable energy sources to nourish the load with the required AC power. The intemperate charge from the battery will be dumped to the dump load unit. The dump load for this situation is the battery stockpiling which would then be able to be utilized to supply power to the load if there should arise an occurrence of deficient power created by essential sources. Squares, for example, photovoltaic model, wind demonstrate, dc-wind conditioning converter display, the energy stockpiling model and dc-dc converter show are incorporated independently before joining with a total hybrid system. The square outline portraying the system theoretical structure is appeared in Figure. The scientific models portraying the dynamic conduct of each of these segments are talked about in next segment.

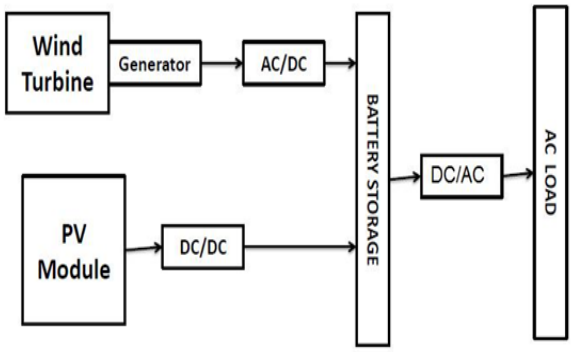

Figure 1.1: Block diagram of system conceptual framework

IV. RESULTS

Wind		Battery	
Power	8.5e3 W	Voltage	300V
Speed	12 m/s	Initial SOC	60%
Maximum Power	0.8MW	Maximum Capacity	7KW
Rational	1 P.V	Normal Discharge current	353.38
		Resistance	6.25 Ohm

PV		Simulation	
Base Power	100e6	t	300-600V
P2 Tolerance	1e-4	V_{iv}	26.3V
Frequency	50 Hz	Nominal voltage	48.0V

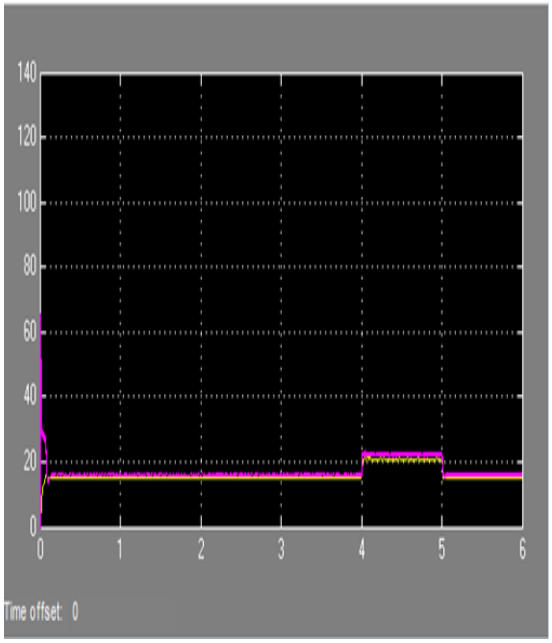

Figure 1.2: Volume of wind and PV array current by fuzzy logic

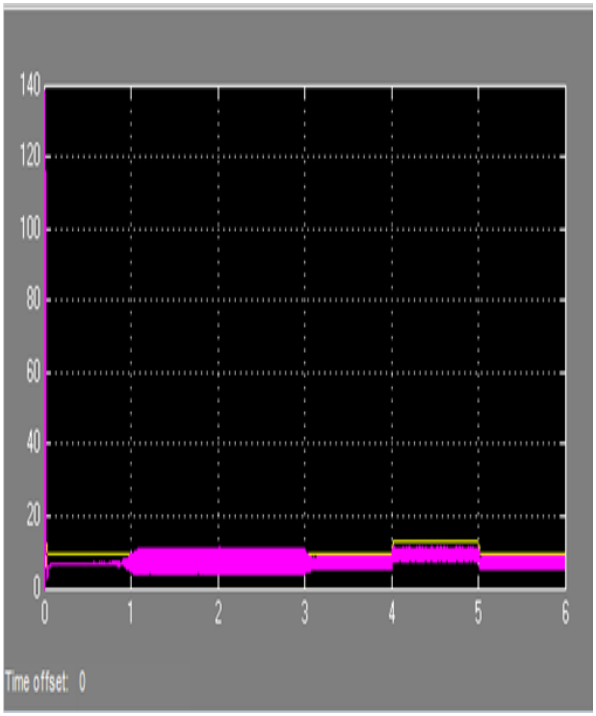

Figure 1.3: Volume of wind and PV array current by PSO

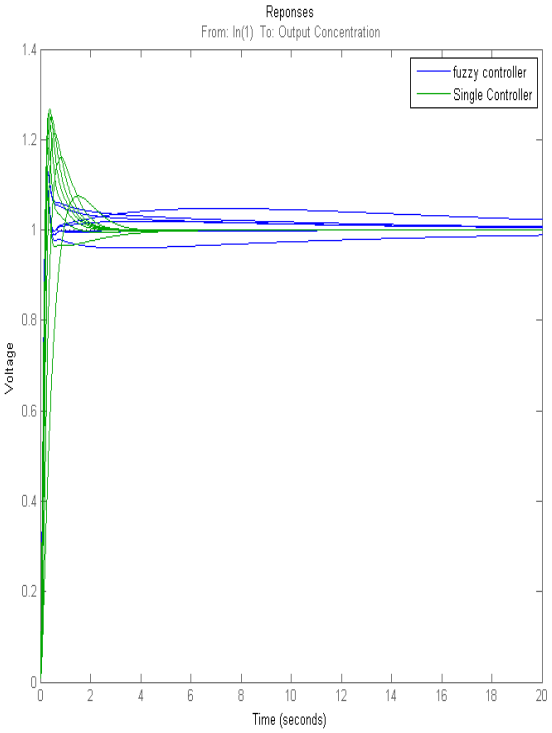

Figure 1.4: Voltage stability comparison

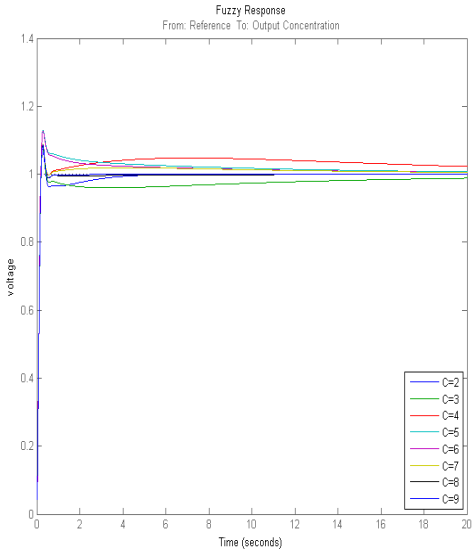

Figure 1.5: Voltage stability comparison in different constraint

V. CONCLUSION

PV cell, module and array are simulated and effect of environmental conditions on their characteristics is studied. Wind energy system has been studied and simulated. Maximum power point of operation is tracked for both the systems using PSO rules algorithm. Both the systems are integrated and the hybrid system is used for battery charging and discharging. Battery discharging reduces by using PSO use in management of load. Power and wind reduce the power loss because effective monitoring of power management

VI. REFERENCES

[1]. Subudhi, B., and Pradhan, R. A (2013). Comparative Study on Maximum Power Point Tracking Techniques for Photovoltaic Power Systems, IEEE Transactions on Sustainable Energy, 4 (1), 89-98.

[2]. Atieno, L. (2013). Optimization of fuel consumption in hybrid Wind-Diesel system using fuzzy logic controller, Unpublished Msc thesis,Juja Jomo Kenyatta University of Agriculture and Technology.

[3]. Tazvinga, Henerica, Bing Zhu, and Xiaohua Xia. "Optimal power flow management for distributed energy resources with batteries." *Energy conversion and management* 102 (2015): 104-110.

[4]. Logesh, R. "Resources, configurations, and soft computing techniques for power management and control of PV/wind hybrid system." *Renewable and Sustainable Energy Reviews*69 (2017): 129-143.

[5]. Soares, Tiago, et al. "Active distribution grid management based on robust AC optimal power flow." *IEEE Transactions on Smart Grid* (2017).

[6]. Badawy, Mohamed O., and Yilmaz Sozer. "Power flow management of a grid tied PV-battery system for electric vehicles charging." *IEEE Transactions on Industry Applications* 53.2 (2017): 1347-1357.

[7]. Ghaddar, Bissan, Jakub Marecek, and Martin Mevissen. "Optimal power flow as a polynomial optimization problem." *IEEE Transactions on Power Systems* 31.1 (2016): 539-546.

[8]. Duan, Jie, Wente Zeng, and Mo-Yuen Chow. "Resilient Distributed DC Optimal Power Flow Against Data Integrity Attack." *IEEE Transactions on Smart Grid* (2016).

[9]. Hosseinzadeh, Mehdi, and Farzad Rajaei Salmasi. "Robust optimal power management system for a hybrid AC/DC micro-grid." *IEEE Transactions on Sustainable Energy* 6.3 (2015): 675-687.

[10]. Madani, Ramtin, Somayeh Sojoudi, and Javad Lavaei. "Convex relaxation for optimal power flow problem: Mesh networks." *IEEE Transactions on Power Systems* 30.1 (2015): 199-211.