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Analysis the Power Optimization in Power Generation System for Micro Grid Application

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Abstract

In distribution generation the power quality is improved with renewable energy. The intermittent energy such as diesel and wind energy generation. The distribution system are connected in both islanded and grid connected system. The reliability is important parameter to enhance the grid performance and reduce the harmonics. The control technique is used in microgrid system for optimizing the power flow. The result is based on the parameter cost and to meet out the load requirements. The design and implementation of hybrid renewable energy based microgrid system through MATLAB/Simulink environment.

Keywords: Microgrid, Distribution system, Wind, Photovoltaic and Genetic Algorithm

Introduction

The DC distribution networks have been making popular inferable from the high effectiveness of energy supply and high reliability in operation. The sustainable power sources interconnect with utility system because of enhanced energy demand and decreasing fossil energies [1-3]. Extremely irregular and discontinuous power is created utilizing RES. Sustainable energy sources alongside capacity framework gives a ceaseless power supply. PV, wind generation and battery capacity framework in a DC microgrid system [4]. To maintain a strategic distance from incorporation issues show in the crossover vitality frameworks, DC dispersion framework is the restricted of arrangement [5]. Utilization of sustainable power source enhances in light of the fact that ordinary sources are destroyed quickly. Anyway, two fundamental limit points exist: power generation and cost of device. DC methods are more vital because of the high effectiveness compared to AC system [6-7].

The energy storage such as battery bank and super capacitor for reducing the fluctuation in power generation system. The generated power is absorbed and provides changes in the operational condition [8]. The island based distribution system has utilized the solar and wind. It comprises in modeling and optimization of electrical production system. The micro grid has connected with various sources to distribute the power to the loads. The island condition based on hybrid renewable energy for increasing the performance using the control methodology. The PV system is used to increase the resolution by reducing the capacity [9-10].

Proposed Methodology

The hybrid renewable energy system is shown in Fig 1. The wind and diesel energy based power generation are integrated on AC bus and solar and battery is connected in DC bus and the generated power is utilized in various application.

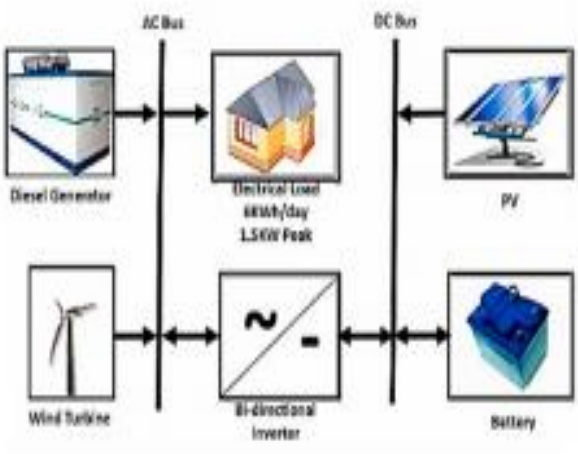

Fig 1: Hybrid Renewable Energy

The generated energy to meet out the load demand and utilized by the bidirectional inverter. The genetic algorithm is based on the artificial algorithm method and functioned as a soft computing application. The flowchart of genetic algorithm is shown in fig 2. The I1and I2 is calculating the power by using the genetic algorithm. Some basic algorithm rules are there such as I1 is better the I2 in all cases or I1 is improved characteristics than I2 in at least one case.

The above condition is false then goes to check I1 has not lead as I2 or I2 has not dominate as I1. Based on the location, to find the evaluations for the wind generator and PV array conditions such as weather data and usable wind and solar resources are used. For the objective functions the available roof area, desired lifetime, and desired availability of power and maximum imported power from the grid limits are considered as design constraints.

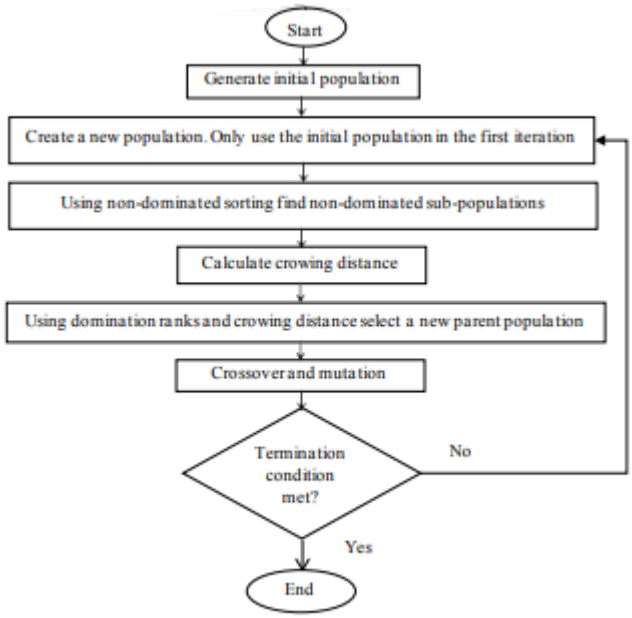

Fig 2: Flowchart of Genetic Algorithm

Simulation Results

The cost value of distribution system has calculated by the utility function. The main aim has to design the generation system and to generate the power by the renewable energy and distribute the power by the bidirectional power converter. The efficient way of power

generation and utilization is achieved by the genetic algorithm under the cost function. The cost function is given as

$$U = u(z)$$

$$Z = [Cost\ A]$$

The optimization algorithm based on hybrid distribution system has given by

$$u(Cost\ A) = \lambda_1 \frac{Cost - (Min(Cost))}{Max(Cost) - Min(Cost)} - \lambda_2 \frac{A - (Min(A))}{Max(A) - Min(A)}$$

The weight factor λ_1 and $\lambda 2$ is calculated by the genetic algorithm. The diesel power generation is shown in fig 3. The battery energy generation is shown in fig 4. The cost function is measured and shown in fig 5.

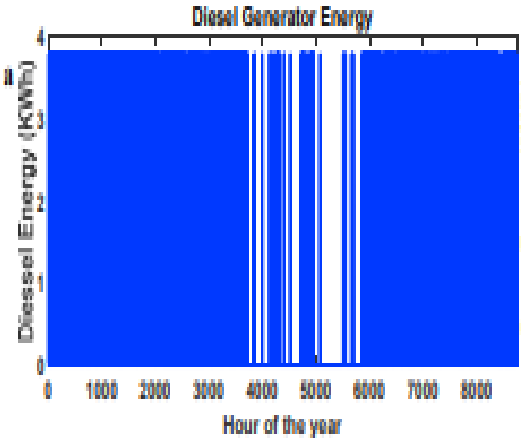

Fig 3: Diesel Power Generation

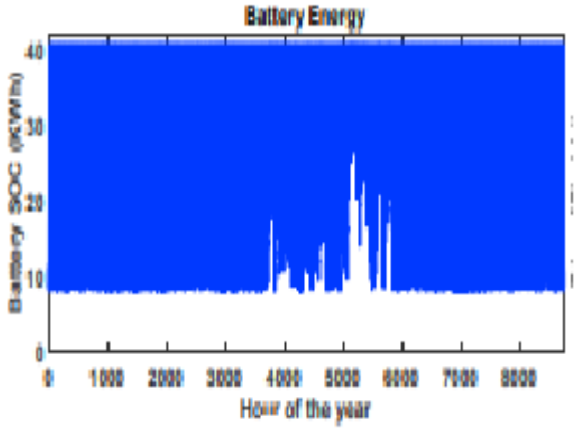

Fig 4: Battery Power Generation

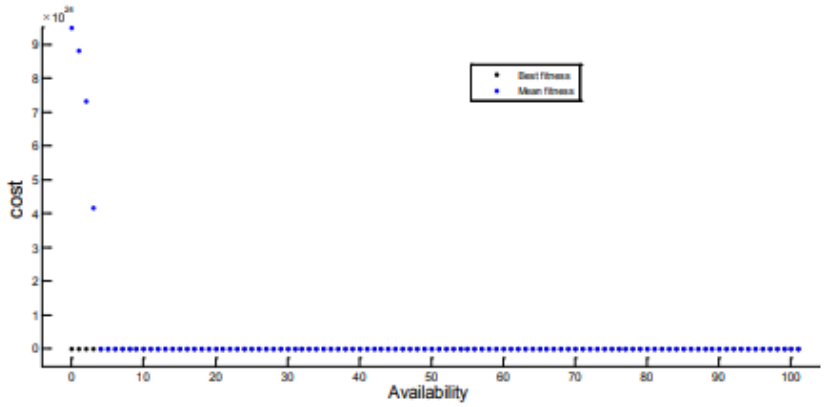

Fig 5: Cost Function

Conclusion

The proposed distribution system considers over estimating the network for eminent level of accessibility by applying precise and raised high transient determination information. The fundamental objective is to accomplish a typical description that measures the accessibility and cost of sustainable power source generation system for DC microgrid. High transient information are accomplished in the proposed power generation system which is used to enhance the hybrid system based on Multi-Objective Genetic Algorithm.

Reference

1. Katiraei, Farid, and Mohammad Reza Iravani. "Power management strategies for a microgrid with multiple distributed generation units." IEEE transactions on power systems 21, no. 4 (2006): 1821-1831.
2. Tsikalakis, Antonis G., and Nikos D. Hatziargyriou. "Centralized control for optimizing microgrids operation." In Power and Energy Society General Meeting, 2011 IEEE, pp. 1-8. IEEE, 2011.
3. Rocabert, Joan, Alvaro Luna, Frede Blaabjerg, and Pedro Rodriguez. "Control of power converters in AC microgrids." IEEE transactions on power electronics 27, no. 11 (2012): 4734-4749.
4. Nehrir, M. H., Caisheng Wang, K. Strunz, H. Aki, R. Ramakumar, J. Bing, Zhixhin Miao, and Z. Salameh. "A review of hybrid renewable/alternative energy systems for electric power generation: Configurations, control, and applications." IEEE transactions on sustainable energy 2, no. 4 (2011): 392-403.
5. Yang, Hongxing, Zhou Wei, and Lou Chengzhi. "Optimal design and techno-economic analysis of a hybrid solar–wind power generation system." Applied Energy 86, no. 2 (2009): 163-169.
6. Kaabeche, A., M. Belhamel, and R. Ibtiouen. "Sizing optimization of grid-independent hybrid photovoltaic/wind power generation system." Energy 36, no. 2 (2011): 1214-1222.
7. Yang, Hongxing, Lin Lu, and Wei Zhou. "A novel optimization sizing model for hybrid solar-wind power generation system." Solar energy 81, no. 1 (2007): 76-84.
8. Yoshida, Hirotaka, Kenichi Kawata, Yoshikazu Fukuyama, Shinichi Takayama, and Yosuke Nakanishi. "A particle swarm optimization for reactive power and voltage control considering voltage security assessment." IEEE Transactions on power systems 15, no. 4 (2000): 1232-1239.
9. Bhowmik, Shibashis, Rene Spee, and Johan HR Enslin. "Performance optimization for doubly fed wind power generation systems." IEEE Transactions on Industry Applications 35, no. 4 (1999): 949-958.
10. Kothari, Dwarkadas Pralhaddas. "Power system optimization." In Computational Intelligence and Signal Processing (CISP), 2012 2nd National Conference on, pp. 18-21. IEEE, 2012.