Analysis of Photovoltaic System Under Variable Load Condition

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Abstract

This paper proposes a new method for the analysis of photovoltaic systems under unreliable conditions. A photovoltaic system is a combination of a number of PV cells connected in series. Solar power systems play a major role in maintaining ecological balance by mitigating global warming and promoting green environments. Solar power systems replace traditional power generation methods with non-conventional power generation methods. This white paper focuses on using solar GIS tools to distinguish between the performance of photovoltaic systems in uniform and non-uniform unreliable conditions.

Keywords- PV module, GIS, power generation.

INTRODUCTION

Due to the rapid increase in power consumption, it is very difficult for utility systems to meet customer demand [1]. In the power system from the power plant to the power distribution system, multiple losses occur, which reduces the voltage profile of the entire power system [2], [3]. Today, to meet energy demand, utility systems are linked to renewable energy resources to meet energy demand and create a pollution-free environment [4]. The main benefits of using solar cells for power generation are environmentally friendly, low pollution, simple design, reliable, durable and most efficient [5], [6]. Because the sun provides energy in almost every geographic region, it is easy to extract the energy from solar cells and convert it into electricity. Since a single PV cell produces only 0.7v, combining multiple solar cells creates a high-power array [7], [8].

WORKING-

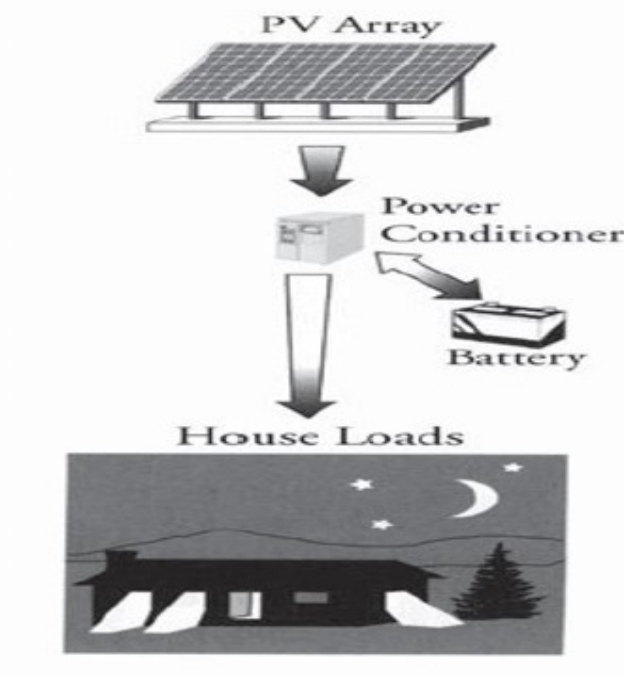

Fig.1 off-Grid PV System

PV systems are essentially off-grid solar PV arrays that do not require external power from the grid to power different customer homes. pv arrays provide electricity directly to the home or office [7]. The array consists of a PV array composed of a number of amorphous crystals connected in series, a battery to store the generated current, a charge controller to prevent overcharging of the battery, and a power conditioner attached to the PV An array that converts DC power to AC power so that customers can use it directly. At night, you can use the power stored in the battery to power your home.Analysis of photovoltaic systems can be performed using software called Solar GIS tools. Solar GIS tools are basically simulation software and are very popular today. The software provides detailed analytical performance of photovoltaic arrays under normal and non-linear operating conditions. Solar GIS tool is a pc software package used for full pv system research, sizing simulation, and data analysis [8]. Measure the size of the solar panel, determine the height of the installation and analyze the generated data. This tool can also be used to examine various system load data and estimate the total energy production in the system. The energy production data evaluated is hourly, weekly, monthly, or yearly performance. Solar GIS tool calculates total estimate for installing solar power system according to customer needs

REFERENCES

[1] C. W. Gellings, “The Concept of Demand-Side Management for Electric Utilities,” *Proc. IEEE*, 1985.

[2] A. Grandjean, J. Adnot, and G. Binet, “A review and an analysis of the residential electric load curve models,” *Renewable and Sustainable Energy Reviews*. 2012.

[3] M. Pipattanasomporn, M. Kuzlu, S. Rahman, and Y. Teklu, “Load profiles of selected major household appliances and their demand response opportunities,” *IEEE Trans.*

Smart Grid, 2014.

[4] E. Benedict *et al.*, "Losses in Electric Power Systems," 1992.

[5] R. Lauge-Kristensen, "Renewable energy," in *Sustainable Practices in the Built Environment, Second Edition*, 2008.

[6] P. Bajpai and V. Dash, "Hybrid renewable energy systems for power generation in stand-alone applications: A review," *Renewable and Sustainable Energy Reviews*. 2012.

[7] R. Sen and S. C. Bhattacharyya, "Off-grid electricity generation with renewable energy technologies inIndia: An application of HOMER," *Renew. Energy*, 2014.

[8] T. Khatib, I. A. Ibrahim, and A. Mohamed, "A review on sizing methodologies of photovoltaic array and storage battery in a standalone photovoltaic system," *Energy Conversion and Management*. 2016.