ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

Micro grid PV Array Modeling using MPPT Technique

Mahesh Kumar[1], Satender Yadav[2]

M.Tech (Research Scholar), Dept. of EE, MRKIET, Rewari, Haryana, India[1]

M.Tech (I.S.) Assistant Professor, Dept. of EE, MRKIET, Rewari, Haryana, India[2]

ABSTRACT: This paper presents a careful evaluation among the most usual MPPT techniques, doing main comparisons with respect to the amount of energy released from the photovoltaic (PV) panel, PV voltage ripple, considering that the models are first implemented via Mat Lab/Simulink®, and after a digitally controlled boost DC-DC converter was implemented In present days all various countries are suffering and worried about climate changing due to pollution and green house. For reduction in pollution and emission of green house gases transmission and distribution side will be bolstered to transmit power generated from large wind farm, geothermal, PV solar system and solar thermal generations. From distribution side, many smaller renewable generators (e.g. photovoltaic, fuel cells, micro hydro etc.) will be connected to the networks.
A Microgrid is a cluster of loads and micro sources operating as a single controllable system that provides power to its local area. To the utility, the Microgrid can be thought of as a single controllable load that can respond in seconds to meet the needs of the transmission system. To the customer, the Microgrid can meet their

KEYWORDS: Microgrid Sub Station using MPPT Techniques, PV Applications, Tracking Factor for MPP, Digital Control.

I. INTRODUCTION

The concern for climate change is driving major changes in electricity generation and consumption patterns. Various countries have set a target of 20 % greenhouse gas reduction by the year 2020. Large scale changes in both transmission and distribution levels are expected to occur in the near future. Transmission systems will be bolstered to transmit power generated from large wind farm, geothermal and solar thermal generations.
In distribution levels, many smaller renewable generators (e.g. photovoltaic, fuel cells, micro hydro etc.) will be connected to the networks. These are called distributed generators (DGs) or distributed energy resources (DERS). Their integration into distributions systems disturbs the radial nature of power flow through distribution feeders. The interconnection of DG to the utility/grid through power electronic converters has raised concern about safety and protection. IEEE P1547 standard [1] provides the technical requirement for the interconnection of the distributed resources (DR) units to the electric power system. The current IEEE recommended industry practice is to isolate all distributed energy resources (DERs, e.g., PV and wind) from the grid in the event of a fault in the grid. This approach is adequate when the total capacity of the DERs is not significant and they can be removed without major impact on the system. However it is expected that the penetration level of grid-connected DERs will increase substantially over the next few decades. In addition, the number of Plug-in Hybrid Electric Vehicles (PHEVs) will increase in the near future and microgrids will become popular in rural communities and commercial buildings. The cumulative effect of these innovations will be a change in the power flow patterns in power distribution systems.

II. MICROGRID MODELING USING MPPT TECHNIQUE WORKING AND PRINCIPLE

For the fluctuating energy generation by solar or wind energy and the fluctuating energy demand, a battery storage unit with a bi-directional inverter can be applied to ensure the power balance and stable operation of the microgrid system.
For balancing and maintain the load characteristic we are using the MPPT system its is DC to DC converter and maintain the load characteristic stable from the photo cell and Booster are used to increase the voltage using voltage

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

double and Filter are used to reduce the loss of line. PV Array are using to genera the 100KW. Rating of one strip is 305 watt and 5 nos. connect in series sorting become 1525Watt .Now these are connect in parallel its rating become 100.650Wat. IGBT use to for switching in booster to charge the capacitor and Three level bride are used to converter the DC voltage to AC Voltage. The growing energy demand coupled with the possibility of reduced supply of conventional fuels, along with growing concerns about environmental preservation, has driven research and development of alternative energy sources that are cleaner, renewable and produce little environmental impact. Among the alternative sources the electrical energy from PV is currently regarded as the natural energy source more useful, since it is free, abundant, clean, distributed over the Earth and participates as a primary factor of all other processes of energy production on Earth [1]. Moreover, although the phenomena of reflection and absorption of sunlight by the atmosphere, it is estimated that solar energy incident on the surface of earth is of the order of ten thousand times greater than the world energy consumption. According to expertise's previsions the PV energy will became the most important renewable energy source until 2040, reaching almost 28% off all world energy consumed [2].

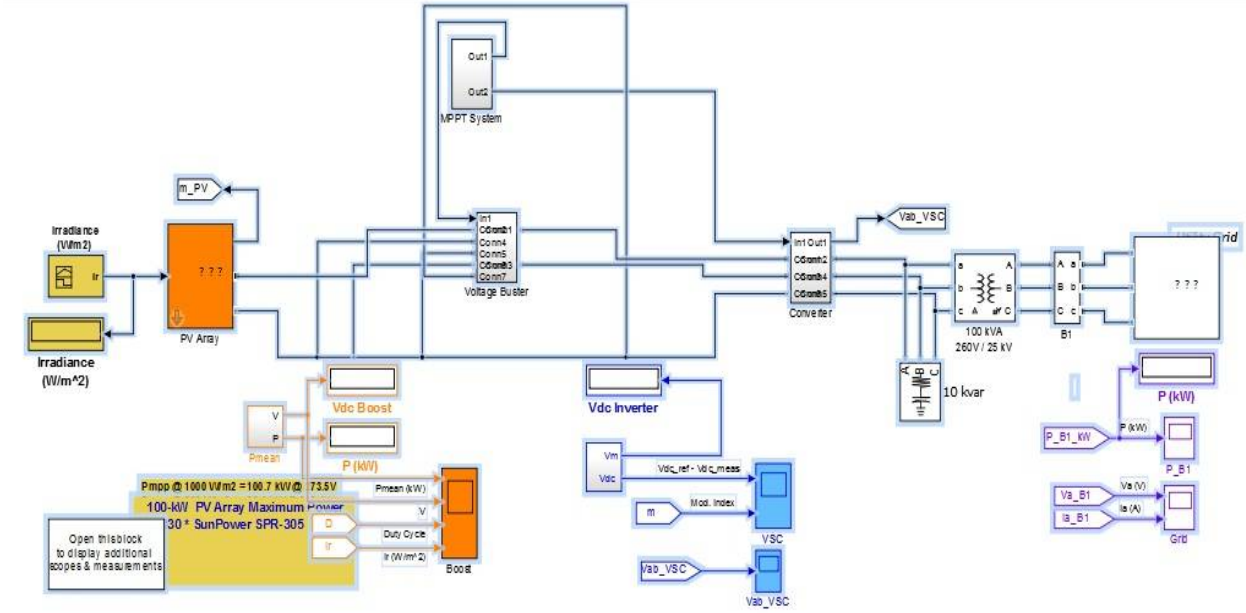

Fig. 2.1 – Microgrid PV Array Modeling using MPPT Technique

III. SIMULATION RESULTS

The average model of the DC-DC boost converter was used to simulate the load variation controlled viaMatlab/Simulink®, and was added a fluctuation in the average model in order to represent the effect of the inductor ripple current. All tests were performed considering the same temperature and irradiation with positive and negative steps. Aiming to compare and adjust appropriately each algorithm according to the application it becomes necessary to provide performance measures that can bemused for comparison criteria. Beyond the typical measures of dynamic responses, there are also additional metrics that are used in these cases. Because the transmitted energy is essential for the use of PV as an energy source, a very important measure is the tracking factor, which is the percentage of available energy that was converted. The ripple voltage in steady state is aloof vital importance, as there is a limit of ripple so that the panel will remain effectively at the MPP. Other factors such as ease of implementation, number of sensors and cost are also desirable. and according to it P&O and IC modified, Ripple Correlation and Beta methods stands out, and the Betamethod can extract the greatest amount of energy from
the PV, being in the order of 98.8%.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

The input wave form of PV Array is showing below.

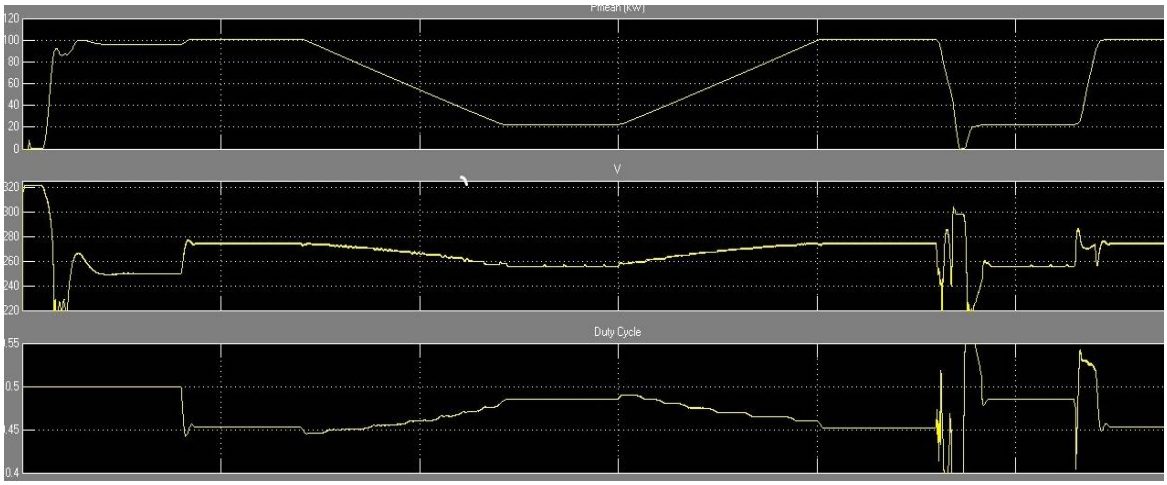

Fig. 2.2 – Input Wave form to PV Array

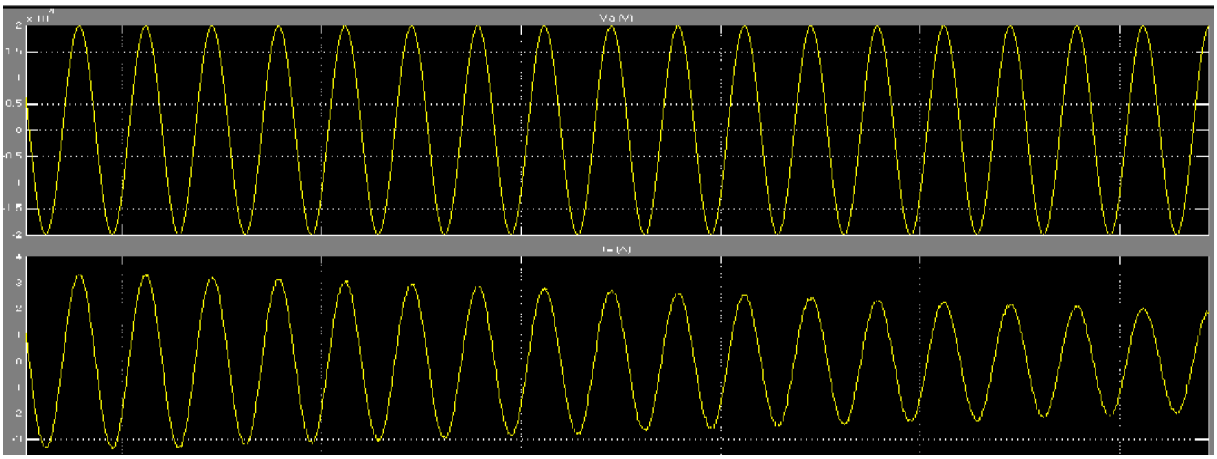

Fig. 2.3 – Output Wave form of Voltage and Current

Output wave form is depend upon the input wave or radiation from sun and also depend the working of MPPT and voltage doublers in which we are using the capacitor and inductor to maintain the characteristic stable .

IV. CONCLUSION

This paper presented a careful evaluation among some interesting and important MPPT Algorithms presented in literature, but in a deeper manner mixing simulation, discussions and experimental results. The simulation procedure also reached the expectation giving similar results as the experimental ones. The initialization methods, MPPT ripple in steady state and the amount of energy extracted (Tracking Factor) from the photovoltaic panel were pointed out. It is necessary to highlight that the use of energy from photovoltaic

1. The objective of this report is to study an experimental model of microgrid-connected distributed generation system.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijareeie.com

Vol. 6, Issue 3, March 2017

2. Its survival time is as large as 20 years or more and therefore the cost of microgrid system is recorded in about 10 years of working. If the rest of the
life of system is up to 25 years leads to service.

3. The experimental model consists of the elements PV, Wind and other distribute energy generation system, and other elements such as the inverter, the controller, the 3-phase source and the load.
4. However, further work is needed to evaluate impact on system lifetime, reliability, and economic and environmental cost.

REFERENCES

[1] Shivkumar V. Iyer, Madhu N. Belur, and Mukul C. Chandorkar,"A Generalized Computational Method to Determine Stability of a Multi-inverter Microgrid" IEEE Transactions On Power Electronics, vol. 25, no. 9, pp. 2420-2432, Sept. 2010.
[2] Shuiming Chen and Hongqiao Yu, "A review On overvoltages in microgrid," IEEE Asia-Pacific Power and Energy Engineering Conference (APPEEC-2010), pp. 1-4 March 2010.
[3] Yun Wei Li and ChingNan Kao, "An Accurate Power Control Strategy for Inverter Based Distributed Generation Units Operating In a Low Voltage Microgrid," IEEE General meeting on Energy Conversion Congress and Exposition(ECCE-2009), pp. 3363 – 3370, Sept. 2009.
[4] Yun Wei Li, and Ching-Nan Kao, "An Accurate Power Control Strategy for Power-Electronics-Interfaced Distributed Generation Units Operating in a Low-Voltage Multibus Microgrid," IEEE Transactions On Power Electronics, vol. 24, no. 12, pp. 2977-2988 Dec. 2009.
[5] Daniel Salomonsson, Lennart S¨oder and Ambra Sannino, "An Adaptive Control System for a dc Microgrid for Data Centers," IEEE Transactions On Industry Applications, vol. 44, no. 6, pp. 1910-1917 Nov.-Dec. 2008.
[6] Y. Zoka, H. Sasaki, N. YoMo, K. Kawahara, and C. C. Liu, "An Interaction Problem of Distributed Generators Installed in a Microgrid," IEEE International Conference on Electric Utility Deregulation, Restructuring and Power Technologies (DRPT-2004), pp. 795-799. 2004.
[7] T. Shimakage, A. Sone, T. Kato, Y. Suzuoki, K. Nishioka, and H. Yamane, "Acceptable Capacity of PV System according to Capacity of NaS Battery in a Microgrid under 30 min Power Balancing Control," IEEE Transmission and Distribution Conference and Exposition, (PES 2010), pp. 1 – 8, Apr. 2010.
[8] Sudipta Chakraborty and Marcelo G. Simoes, "Advanced Active Filtering in a Single Phase High Frequency AC Microgrid," IEEE Power Electronics Specialists Conference (PESC '05), pp. 191 – 197, Jun. 2005. 43