

# DC Micro Grid Using Boost Converter With Perturb and Observe Method for Maximum Power Point Tracking

Alex Stanley Raja T, Senthil Kumar R, Santhosh Kumar K V, Nandhakumar A

**Abstract** – This paper deals with the DC microgrid that can be controlled wirelessly and smart that can be used for the optimal usage of power that is taken from the Distributed Renewable Energy Generators (DREGs). The usage of the solar PV array that provides the power for commercial lighting, Direct Current loads inclusive of LED lighting and ceiling fans that are incorporated into the given system here for microgrid without any problem is portrayed in this paper. Here we use perturb and observe technique of Maximum energy point tracker to obtain the most electricity and the DC to DC boost converter is used to enhance the voltage from the solar array. They are simulated in MATLAB/Simulink.

**Keywords** – Boost, Micro grid, MPPT Tracking .

## I. INTRODUCTION

The mounted North American nation electrical utility infrastructure was formed additional than one hundred years past. The selection for an AC grid became created on standards; AC voltage had higher transmission range with better overall performance and AC cars and generators were additional worthy and more useful when compared with the ones that run on DC. The grid in recent times is inclined and comparatively not efficient whereas in analysis to distributed era [1].5% transmission/distribution electricity losses were observed in the grid. The introduction of semiconductor physical science, that need a input DC source and the current speedy evolution of renewable electricity technology area unit had dramatically changed the way of transmitting, distributing and utilizing the electrical strength.

Most of brand name new electrical —lighting fixtures, adjustable-tempo cars, brushless DC vehicles, computing and articulation device—are additional well suited with Direct Current power [2]. Most of the Distributed Renewable Energy Generators (DREGs)—which embrace sun electrical phenomenon (PV), fuel cell, wind, corrected excessive- frequency generator outputs on small mills or flywheels, batteries, and extremely-capacitors that can create DC voltage. Therefore DC electricity has exceptional capability for improved usage with the low penetration, distribution-related DREGs, the commonly used PV.

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\*Correspondence Author(s)

**T Alex Stanley Raja**, Asst Prof, Department of EEE, Bannari Amman Institute of Technology, Sathy, Tamilnadu, India.

**R Senthil Kumar**, Professor, Department of EEE, Bannari Amman Institute of Technology, Sathy, Tamilnadu, India.

**K V Santhosh Kumar**, Asst Prof, Department of EEE, Bannari Amman Institute of Technology, Sathy, Tamilnadu, India.

**A Nandhakumar**, Asst Prof, Department of EEE, Bannari Amman Institute of Technology, Sathy, Tamilnadu, India.

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Tremendous enhancements had been created inside the trail of the past decade within the general performance and fee effectiveness of sun PV era, however particularly very little improvement has come about in techniques for dynamic PV strength into a common form, this can be primarily due to the loss of devising a method to hand over purchasers and therefore the unnatural money that is used on analysis and improvement. Rather than taking a swish study the standard approaches to make use of the distributed Photo voltaic strength, most packages really stress it to adapt to a tool that return to be designed for centralized technology quite 100 years inside the on the far side. As an example, inverters are a unit constantly want to convert the DC power from the PV to AC energy ahead of its miles enforced to the burden. DC to AC inversion is an inherently complicated and pricey approach, and therefore the inversion process will be avoided. what is more, common place machine liableness is appreciably affected and is often restricted by suggests that of the electrical converter[3]. Voltage inversion is likewise gratuitous if a large amount of the DC load is placed in shot distance to the started PV. There are unit various examples whereby this can be the case; 3 of the foremost traditional being commercial lighting, High voltage VAC, and computing/ report employed in the residential usage and business

## II. DC- DC BOOST CONVERTER

Here forty eight V is regenerated to one hundred twenty V, inductance L=one hundred small Henry and capacitance C=one hundred small capacitance unit. Switched mode provides will be used for heaps functions like DC - DC converters. Often, despite the fact that a DC deliver, which has battery, will be offered, its offered voltage isn't applicable for the machine being provided. As an example, the motors used in driving electrical cars need a great deal higher voltages, within the region of 500V, than are going to be provided by A single battery is not alone useful, so banks of batteries had been used, the additional weight and space obsessed would be too high notch to be wise. The answer to the current bother is to use fewer batteries and to strengthen the offered DC voltage to the specified level with the help of the usage of a carry converter [4]. Another downside with batteries, huge or tiny, is the variation of the voltage in the output side as a result of the offered rate is employed up, for the sake of some purpose the voltage in the battery has dipped too low to take of the power that is fed to the circuit.

But when the voltage is very low can also varied to higher value as the maximum amount as a helpful level all over again, via employing a boost converter; the lifestyles of the battery could also be prolonged.

The DC enter to a lift convertor could also be from several assets additionally to batteries, together with corrected AC from the mains deliver, or DC from star panels, fuel cells, dynamos and DC mills[5]. The boost converter is outstanding to the Buck converter therein it's output voltage is adequate, or improve the input voltage, but it is essential to stay in mind that, as energy (P) = voltage (V) x Current (I), if the output voltage is improved, the offered output current need to lower. Fig.1 shows the basic circuit of a Boost converter.

However, in this case the switching transistor is a electricity MOSFET, both Bipolar strength transistors and MOSFETs can be utilized in energy switching, the choice being decided via the modern, voltage, switching tempo and cost problems.

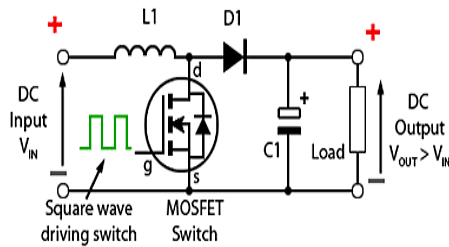


Fig. 1 Basic Boost Converter Circuit

The rest of the components are much like those used in the greenback converter illustrated in Fig. 1, besides that their positions were rearranged.

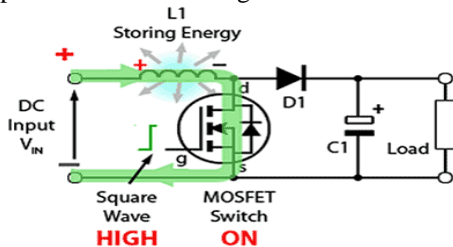


Fig.2 Boost Converter Operation at Switch On

Fig.2 the circuit movement throughout the preliminary high period of the excessive frequency sq. wave accomplished to the MOSFET gate at start. Throughout now MOSFET conducts, increase the circuit from the correct hand factor of the inductor L1 to the terrible enter provide terminal[6]. Therefore a gift day flows among the excellent and atrocious provide terminals via L1, that outlets power in its magnetic subject. There is sincerely no modern flowing within the comfort of the circuit as result of the combination of D1, C1 and also the burden represent far higher electric resistance than the direction directly through the intently winding up MOSFET.

Fig.3 shows the present path at some purpose of the low length of the shift sq. wave cycle. Because the MOSFET is suddenly switched off the sudden call contemporary reasons L1 to deliver a decrease once more voltage. Within the

contrary polarity to the voltage throughout L1 for the length of the on length, to keep up up-to-date.

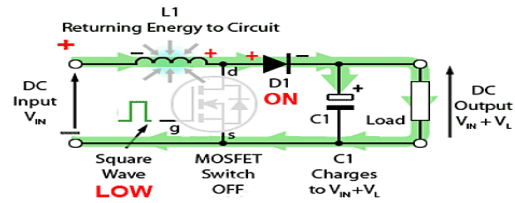


Fig 3 Current Path with MOSFET Off

This effects in voltages, the provision voltage  $V_{IN}$  and therefore the came back emf. ( $V_L$ ) throughout L1 in assortment with one another. This higher voltage ( $V_{IN} + V_L$ ), currently that there is no gift day direction through the MOSFET, ahead biases D1. the following up-to-date via D1 charges up C1 to  $V_{IN} + V_L$  minus the tiny forward fall throughout D1, and in addition assets the burden.

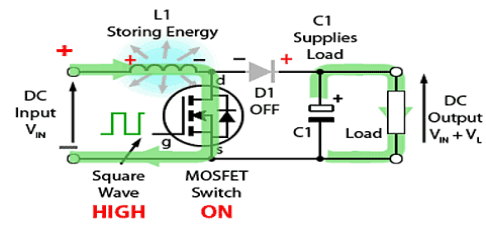


Fig.4 Current Path with MOSFET On

Fig.4 suggests the circuit action at some point of MOSFET on the time at the initial time to begin up. When the MOSFET is conducting every time, the cathode D1 is larger than its anode, because of the rate on capacitor C1. Diode D1 has grown to become not working when the output is switched off the circuit is removed from the enter, but the load is still provided with  $V_{IN} + V_L$  from the price on C1.

### III. PERTURB AND OBSERVE METHOD – MPPT

Perturb and Observe is one the best MPPT techniques with wonderful overall performance and may be effortlessly applied in low rate structures. Some further refined techniques are based totally at the identical principle employed in P&O technique. The precept lies in annoying the voltage or the trendy of the PV module and looks its impact on the subsequent strength. The set of rules compares the energy of the preceding step thereupon for the subsequent step so as that it will growth or decrease the voltage or current-day. These technique changes the reference value, which can be a daily up to date or voltage. The in operation purpose is then sporadically enraptured toward the MPP via either increasing or reducing the array voltage or current. The contemporary is then changed at a daily fee that represents a parameter that ought to be adjusted to accumulate trade-off between quick dynamic response and reduced traditional Ripple[7].

The multidimensional language illustration of P&O is given in Figure 5, that concerns every voltage and with-it sensors. Its well value to say that the performance is advanced by means that of adjusting the step for the converter’s obligation cycle, so as that following is adjusted to raised gain MPP. Once such step is variable, the approach is observed as changed P&O.

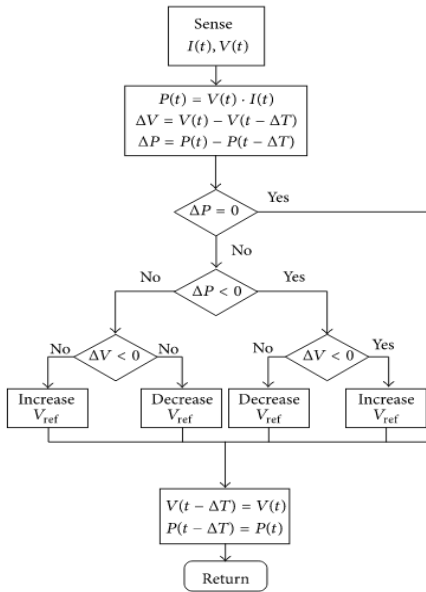


Fig.5 P&O MPPT

IV. MATLAB MODELS & RESULTS

Fig.6 shows the simulink model of the microgrid that is used with the boost converter.

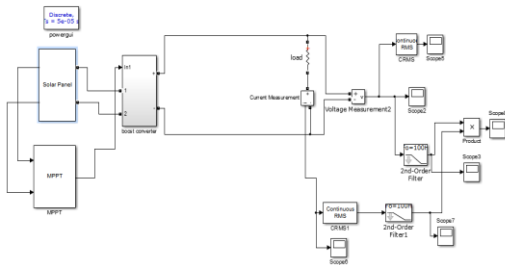


Fig 6 Simulink Microgrid

Fig. shows the simulink model of the solar cell that is designed separately for the microgrid system.

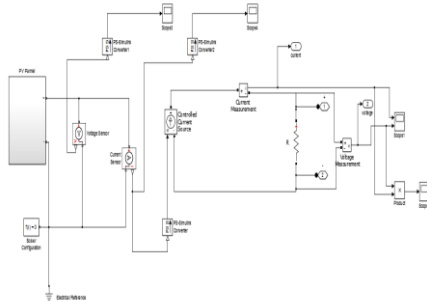


Fig.7 Simulink solar cell

The matlab model of the microgrid using boost converter with the perturb and observe method for maximum power

point tracking is simulate and VI and PV graphs are obtained for the same.

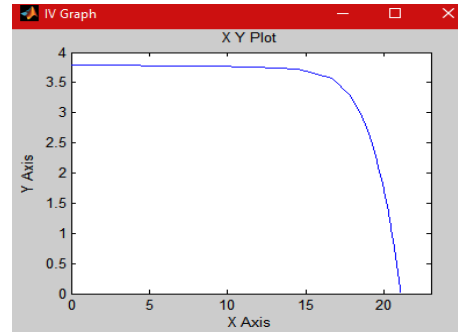


Fig.8 IV GRAPH

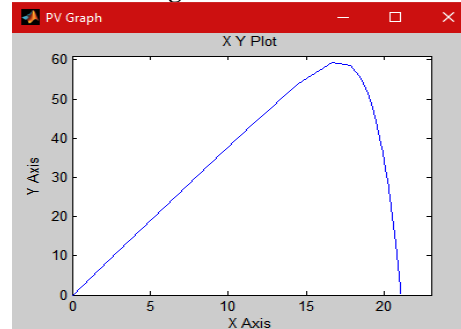


Fig.9 PV GRAPH

The result shows a considerable rise in the maximum power that has derived and fed to the microgrid.

V. CONCLUSION

Thus the MATLAB/Simulink is simulated for exceptional conditions of the energy deep-rooted of the sun cell. Perturb and take a glance at technique is employed to music the utmost power issue. The DC-DC boost convertor is operated by the heartbeat deep-rooted of the MPPT (Maximum Power Point tracking).By mistreatment the perturb and observe approach most potency is created and evidenced in MATLAB/Simulink.

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