Design and analysis of LUO converter based DMPPT and CPG for solar PV system

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Abstract— There is increasing urgent energy issues day by day, that’s why the globe is giving high importance to the installation of new energy and its co-technology. Now, high solar power generation and the scale of renewable energy has developed much. Meanwhile this is the way to rule the development of pv industry. Anyway it has its own characteristics different from power generating grid connected PV power station the problems may arises on its security, stability, reliable operation which the grid and PV power plant should face. The main objective of this new proposed method is to introduce a controlling concept of power in the solar pv systems. The controlling concept introduced accompanied with the distribution constant(cpg). This will purely dependents on the total power presented on the solar system. This new method of control concept is used to increase the temperature raise concept and the high usage factor of PV systems.

Index Terms— ADC-Analog to digital converter, CPG-constant power generation, DMPPT-Distributed maximum power point tracking, PV-photo voltaic.

1. Introduction About DMPPT and CPG

MPPT is highly suitable and effective in order of getting maximum power from the solar energy. Now on connecting more and more panels in order to get high power there might be many problems. 1. Initially, high loading will occur on the case of high voltage and frequency mismatch. 2. Decreasing usage of inverters in the state of less power range. 3. Temperature level will be increased to a vast level on increasing the panels. To overcome this problem, the method of adding transformer as well as conductors can be Implemented. The important notification is to add those components on the sub power stations areas only. Till present the usage of solar inverters and the temperature raise of this system is until remains stable. The proposed concept here deals completely with the LUO converter as well as DMPPT functioning. This new control concept can able to avoid the high loading problems. At the same time the control ability of the management of power has its role on the smooth of the output level. The two-stage performance of single phase solar system is suitable for all resident application. Here the output power of the PV system is purely depending on the nature only. The output power with the time ratio will be equals to the limited power of all time. If the available power of the panel is high than the rated value of the battery. Then the controller tends to instruct the converter to act as the buck mode. This is only for the buck mode of operation of the converter. Meanwhile, if the available power of the panel is low than the rated value of the battery. Then the controller tends to instruct the converter to act as the boost mode. This is only for the boost mode of operation of the converter.

2. LUO converter design

LUO converters are simplest form of DC-DC converter which operates on voltage lift technique. This LUO converter operates on PUSH-PULL state. The switched type LUO converter is developed. Switched capacitor DC-DC converters are made only of switched capacitors. LUO converter can be incorporating Impedance network. It helps to Buck or Boost the output voltage of PV, depending on the value of Duty cycle and also acts as a second order filter. The DC-DC converters are used to convert a DC power at one voltage level to another one. In recent years, the modern power electronic systems require power supply with high reliability, high efficiency, and low input ripple. In all DC-DC converter voltage and efficiency is limited by parasitic elements. LUO Converters are newly developed DC-DC converter to overcome the above limiter effects.

3. Circuit Operation of LUO Converter

To analyze the operation of this Luo converter, here ‘S’ is indicated as the switch’s’ is the diode of freewheeling. Passive energy storing components are inductors and capacitors namely L1, L2 and C1, C2. The circuit operation of LUO converter functions in the modes. At once when the switch is in ON state, storing elements L1 IS charged due to the initial voltage ‘E’. At the same instant the ‘L2’ will tends to absorbs energy from source and ‘C1’. This load is given energy by the C2 when the switch ‘S’ in the off state the current coming from the supply will tends to ‘0’. Current ‘IL1’ to the diode flowing is to charge the ‘C1’ IL2 along with the C2 and R now the diode tends to operates in the continuous mode. To understand the function of this LUO converter, the entire circuit is separated in to two states. When in ON state the L1 inductive element is charged due to the E voltage. Meanwhile, at the same cost L2 inductor prefers to save the energy. At the OFF state the current picking to the source is
null. In this OFF state mode, the operation will be in the Discontinues mode continuously.

![Fig.2. Luo converter circuit](image)

**A. Mode 1**

At the switch is in ON state the energy storing element L1 will charge by the source. At the same instant, L2 picks the energy from supply and C1. The load is given power by C2. when the switch is ON, the inductor L1 is charged by the supply voltage E. At the same time, the inductor L2 absorbs the energy from source and the capacitor C1. The load is supplied by the capacitor C2.

![Fig.3 Mode1 operation](image)

**B. Mode 2**

When the switch is in the off mode the current from the supply here tends to comes '0'. Inductor current IL1 flows to the diode in order to charge C1.

![Fig.4 Mode2 operation](image)

In this mode the main point is that the diode is absent and the L1 will discharge through output and C2. The output stage of this LUO converter is accompanied with the inductor and capacitor. The output voltage stores and sends the supply to load, in order to smooth the voltage to produce a output voltage constantly. Selection of the storage elements directly has contact with the ripple current and the IL1. Inductive elements may get varied it has a typical value of 20% tolerance. Reducing the DCR value will tends to increase the performance of the used components. The value of DCR is reduced for low inductive ranges.

![Fig.5 Graph for module power and voltage](image)

![Fig.6 Flowchart for per tube and observe algorithm](image)
Fig. 7. Simulink model of system

Fig. 8. PV model

Simulation Results

Fig. 11. Output voltage across the inverter (vo)

Fig. 12. Generated DC
4. Conclusions

In this proposed paper the distribution tracking of power is used. Here CPG is also used in order to get maximum power from solar system. On the usage of these, moreover 80% it will much better than the existing method. On the usage of this DMPPT almost the maximum power can be extracted from the sun, it orients much more application due its output performance. The output of this operation is verified by the simulation results. Henceforth the results are verified on the different solar level as well as temperature.

References


