Improving Power Output in Partial Shading of Photovoltaic Panels (Ramot)

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The Invention

A controllable circuit for maximizing and stabilizing output power in PV panels under conditions of partial shading. The low cost high reliability device allows maximum power to be extracted during uneven shading conditions. Furthermore, the output power curve is quite linear without multiple peaks which makes it easy to sync several PV sources together.

The Need

In order to get useful power from PV fields, several PV panels are connected in serial. Without any correction, shading of any of the panels would cause the total output to be limited strictly by the current of the shaded panel. (In an extreme case, if only one panel were completely shaded, the power output of the entire string would be zero.) Conventional PV fields use bypass diodes to improve the power output under shading conditions, however, this is insufficient to take advantage of all of the energy supplied in the string.

Advantages

Our method uses an intelligent circuit which constantly monitors the generated power and can adjust quickly whenever shading occurs and uses an energy return current to extract all of the available power from the PV series. Comparative simulation tests have shown an increase of 42% power extracted over bypass diodes for the case of 22% area shading. A further advantage is the flat power output curve with voltage which makes the series easier to synchronize with other PV sets.

Potential applications

Solar field operators will greatly benefit by using this device which will increase generated solar power and have a very short ROI.

Patent

Worldwide PCT patent submitted

Stage of Development

The circuit has been designed and simulations run. It is ready for implementation.

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