Comprehensive comparisons of improved incremental conductance with the state-of-the-art MPPT Techniques for extracting global peak and regulating dc-link voltage	
Authors	**Ibrahim Al-Wesabi, Zhijian Fang, Hassan M Hussein Farh, Abdullrahman A Al-Shamma'a, Abdullah M Al-Shaalan**
Publication Year	2024
Grant Number	IMSIU-RG23065
DOI link	10.1016/j.egyr.2024.01.020

Abstract: The grid-connected converters with two stages are frequently used in renewable energy technologies and applications. Designing the dc-link voltage management scheme is challenging due to the ripples and fluctuations at the dc-link voltage in the grid-connected photovoltaic battery energy storage systems (PV/BES), which results in significant harmonic distortion, ripples, and a decreased power factor. The large electrolytic capacitors, that have a limited lifespan, are frequently utilized at the dc-link in order to decrease such ripples and oscillations. To maximize the lifespan of power converters, It is crucial to substitute the large capacitors with small capacitors, that have a very long lifespan and its small capacitance cause a significant fluctuations in the output current and overvoltage due to their large ripples on the dc-link voltage. In this paper, to extract the global peak (GP) of PV system without any ripples around the GP and Improving the dynamic performance of the entire system. First, an improved incremental conductance (IINC) technique compared to state-of-the-art MPPT techniques are proposed. Second, to stabilize the dc-link voltage, the PV array's power, and the battery's state of charge (SOC) are both controlled by the dc-link control system using a straightforward and novel d-q current regulation technique. In this instance, the low sampling frequency of the dc-link controller allows for a cost-effective solution. For this reason, the proposed IINC catches the GP with advantages of quick convergence, improved tracking effectiveness, and decreased tracking time. Moreover, the IINC is utilized in a DC-DC step-up converter to boost the output power and voltage of solar panels while lowering switching and conduction losses. In order to provide the grid system with a better AC output of higher quality, the amount of harmonics is therefore suppressed using the d-q innovative control. The simulation and experimental outcomes revealed the resilience performance of the proposed improved IINC with novel d-q current in regards to accurate GP extraction, tracking speed, tracking efficiency and oscillations at steady state compared to seven state-of-the-art MPPT methods, as well as the ability to overcome the harmonics in the output current of inverter and stabilize the dc-link voltage.

هـ-خوجه