

Highlight the original contributions of paper and the highlight the advantages of proposed method

This paper presents a new control scheme based on STA-PCC method for a grid connected VSC interfaced with two RES (Wind Turbine, PV array) and BESS. The good performance of the proposed methods for controlling the various converters associated to the HRES was shown through extensive simulation studies.

The main contribution and advantages of the developed hybrid renewable energy system are the following:

- The analysis of the scheme combining the adaptive super-twisting (STA) and the predictive current control (PCC), known as sliding mode predictive current control (STA-PCC) for hybrid scheme with PV array, BESS and wind generator has been attempted for the first time in this work.
- The PCC is developed for the considered system and implemented for the first time in available literature.
- The proposed hybrid system has been tested with the developed controller under various operating conditions for the first time in this work.
- The performance of the proposed STA-PCC method for VSC has been compared with those of the classic controls, like: standard PI-PCC, Hysteresis Current Control (HCC), Voltage Oriented Control (VOC) and the conventional lookup table Direct Power Control (DPC) strategies for the first time in this study.
- The performance of the proposed STA-PCC is better than those of the other existing methods with reduced overshoot, fast settling time and steady-state error.
- The proposed control can enhance the performance and durability of the BESS and the setting time response of the VSC (around 0.01 sec).
- The efficiency and THD of the system were improved considerably (less than 2%) through the robust and efficient strategy control applied in the VSC.
- The proposed approach provided a stable operation of HRES.