3- D. yousri, S. babu, E. bshr, M.B. Etieba, and Dalia Allam. "A Robust Strategy Based on Marine Predators Algorithm for Large Scale Photovoltaic Array Reconfiguration to Mitigate the Partial Shading Effect on the Performance of PV System". IEEE ACCESS. Volume8, Page112407-112426, DOI10.1109/ACCESS.2020.3000420, Published June 2020.

Abstract

Large-scale solar photovoltaic (PV) plants play an essential role in providing the increasing

demand for energy in recent time. Therefore, in the purpose of achieving the highest harvested power under the partial shading conditions as well as protecting the PV array from the hot-spot calamity, the PV reconfiguration strategy is established as an efficient procedure. This is performed by redistribution of PV modules according to their levels of shading. Motivated by this, the authors in this article have introduced a novel population-based algorithm that is known as marine predators' algorithm (MPA) to restructure the PV array dynamically. Moreover, a novel objective function is introduced to enhance the algorithm performance rather than utilizing the regular weighted objective function in the literature. The effectiveness of the proposed algorithms based on the novel objective function is evaluated using several metrics such as fill factor, mismatch losses, percentage of power loss, and percentage of power enhancement. Besides, the obtained results are compared with a regular total-cross-tied (TCT) connection, manta ray foraging optimization (MRFO), Harris Hawk Optimizer (HHO) and particle swarm optimizer (PSO) based reconfiguration techniques. Furthermore, to demonstrate the suitability of the proposed methods, large scale PV arrays of 16×16 and 25×25 are considered and evaluated. The results reveal that MPA enhanced the PV array power by percentage of 28.6 %, 2.7 % and 5.7 % in cases of 9×9, 16×16 and 25×25 PV arrays, respectively. The comprehensive comparisons endorse that MPA shows a successful shade dispersion; hence the number of multiple peaks in the PV characteristics has reduced, and high values of power have been harvested with least mean execution time in comparison with PSO, HHO and MRFO. Moreover, the Wilcoxon signed-rank test has been accomplished to confirm the reliability and applicability of the proposed approach for the PV large scale arrays as well.