

There is a great interest in the development of renewable power technologies in Algeria, and more particularly hybrid concept. The present paper has investigated the performance of hybrid PV–Wind–Diesel–Battery configuration based on hourly measurements of Adrar climate (southern Algeria). Data of global solar radiation, ambient temperature and wind speed for a period of one year have been used. Firstly, the proposed hybrid system has been optimized by means of HOMER software. The optimization process has been carried out taking into account renewable resources potential and energy demand; while maximizing renewable electricity use and fuel saving are the purpose. In the second step, a mathematical model has been developed to ensure efficient energy management on the basis of various operation strategies. The analysis has shown that renewable energy system (PV–Wind) is able to supply about 70% of the demand. Wind power has ranked first with 43% of the annual total electricity production followed by diesel generator (with 31%) while the remaining fraction is being to PV panels. In this context, 69% of the fossil fuel can be saved when using the proposed hybrid configuration instead of the diesel generators that are currently installed in most remote regions in Algeria. Such a concept is very promising to meet the focus of renewable energy program announced in 2011