

## **Analysis and prediction of battery operating state in Kenyan solar home systems**

Solar power is a valuable source of electrical energy for users in the developing countries, yet many solar home systems are working at indeterminate conditions, much to the dissatisfaction of the users. Lead acid batteries are extensively used in the Kenyan standalone solar home systems (SHS). Batteries experience a wide range of variable operational conditions in PV applications which make it very difficult to accurately predict battery performance and lifetime in PV systems. Premature failure and lifetime prediction of batteries have become major concerns within the PV industry and amongst the users. Given the highly variable operating conditions of many of these SHSs, no battery model has achieved a good compromise between the complexity and precision. This study seeks to analyze and develop simplified mathematical model(s) for predicting lead acid battery operating states in Kenyan standalone solar home systems to assist in determining the mean time to failure under stated conditions. Several factors that affect battery behaviour will be considered, such as the rate and efficiency of charging, the self-discharge rate, discharge rate, including the battery capacity.

