

## **Supply of energy for productive use through rural mini-grids in emerging markets**

This project investigates the impact of productive use on photovoltaic (PV) mini-grid systems by studying the operation of a specific system located in Tanzania and operated by E.On Off-Grid Solutions (EOGS). A considerably large number of people still have no access to electricity, most of which live in the rural parts of emerging countries. The past decade has seen a rise in mini-grids powered by renewable energy sources (RES) in an attempt to solve this problem. However, in order for these projects to be economically viable and achieve significant socio-economic impact, they must incorporate productive use, which is the use of electricity for income-generating purposes. The complete PV system and mini-grid in Itaswi, a rural village in Tanzania, is modelled and simulated using MATLAB/Simulink. Three main conclusions were arrived at: (1) Up to 700W of additional load can be supported by the system as it currently is. (2) Power factor correction may become necessary when adding productive use type of loads and (3) Demand Side Management is critical to maintain system integrity for such systems with limited generation capacity. The study confirms that productive use introduces power factor drop and higher currents. To increase commercial loads therefore requires critical system upgrades and modifying operation procedures. This work also discusses how to consider the impact of productive use loads when designing and constructing such power systems.