Abstract

It is a well-known fact that electricity is essential for national development and many third world developing economies, have prioritized adequate energy provision to its populace as a key economic pillar. Despite this, many regions in these countries remain unconnected to electric power grids. Today, only about 35% of Kenyans have access to the countrys electricity grid. Principal alternatives to connecting the remaining users include grid extensions and off-grid generation. It is important to assess these alternatives from an economic viewpoint..

This study has primarily focused on an economic appraisal for electricity planning, looking at the extension of the grid to Wajir town which is currently supplied by off-grid diesel power plants. The main objective was to carry out an economic study comparing the cost of off grid generation to the cost of investing in transmission infrastructure focusing on regions supplied off the national grid.

The study was conducted via a detailed data gathering exercise at the Kenya Power and Lighting Company (KPLC) off-grid office, the KPLCs rural electrification office and the Kenya Electricity Transmission Company (KETRACO). The data included cost of operation and maintenance, installation cost, historical fuel costs, historical data on power and energy generated from the plant. A load flow study was carried using PSS/E^{TM} software to model the transmission line and its effect on the existing transmission grid. The power flows from the model were used to assess the need for reactive compensation hence the inclusion of the reactors as part of the installation. It was also useful in sizing of the electrical switchgear and transmission line conductor to be used.

From the results obtained, it was observed that the cost per kilowatt-hour of building the transmission infrastructure **USD 0.2125 /kWh per annum** while that of remaining off grid and putting up a diesel plant to sufficiently supply the load until 2030 was **USD 0.42 /kWh per annum**. It was concluded that the option to extend the transmission line from Garissa County to Wajir County would be recommended for this as the most economical option in the area under study. The grid connected supply would have other environmental benefits of utilization of the hydro-electric renewable energy source over the diesel generator powered off-grid alternative.