Rural microgrids cape town

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Our electric power system was design to move central station alternating current (AC) power, via highvoltage transmission lines and lower voltage distribution lines, to householders and businesses that used the power in incandescent light, AC motors, and other AC equipment. But, extending the electric grid to remote rural areas is uneconomical to carry out.

Much research has been carried out into many aspects of rural electrification. One of the main aspects for the slow pace of rural electrification is simply the enormous cost associated with extending electricity grids to rural areas or establishing isolated mini power systems for rural communities (Mutale et. al, 2007). South Africa is a large country and has many rural areas. There is always no

Electrification of these areas requires new and cheaper technologies. It is more viable to directly use the power generated by a distributed renewable energy source nearby. This eliminates the enormous cost associated with extending electricity grids. Moreover, 12V (or 24V) DC appliances are relatively inexpensive in the concept when compared to AC appliances as they don''t require buck converters to step down the 230V AC to 12V (24V) DC required by most of the appliances.

Hybrid renewable energy systems have been accepted as possible means of electrifying rural outlying areas where it is too expensive to extend the grid to supply them. As stipulated in the introduction, the system is intended to power households, and it must be cost effective; therefore, only solar energy system is retained. Figure 1 shows the overview of the low voltage DC microgrid system.

A photovoltaic (PV) generator is the whole assembly of solar cells, connections, protective parts, supports etc. (Gonzalez, 2005). A photovoltaic (PV) generator converts sunlight energy into electricity. The energy produced by the solar system is reliant on climatic conditions.

A photovoltaic system consists of cells at a basic element level. These cells can be connected together in series to form modules (or Panels). Figure 2 shows a moderate model of a PV cell used in this paper.

This model consists of a current source (IL), a diode (D), and a series resistance (Rs). The net current of the cell is the difference of the photocurrent, IL and the normal diode current Io; the model included temperature dependence of photocurrent IL and the saturation current of the diode Io. The equations which describe the I-V characteristics of the cell are (Gonzalez, 2005):

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Web: https://www.hollanddutchtours.nl/contact-us/
Email: energystorage2000@gmail.com
WhatsApp: 8613816583346