

## **Abstract**

In the power sector of the Sri Lanka, 65% of required energy is generated by using Fuels. Today, the cost of electricity is very high in Sri Lanka due to all necessary fuels being imported from other countries.

Renewable sources of energy including solar power, small scale hydro power have emerged as an economical and sustainable alternative source to promote medium term electricity generation to the rural isolated houses. Since Sri Lanka is situated close to the Equator, solar radiation over the island does not show discernible seasonal variations. The average solar radiation remains at 5.0 kilo Watt-hour/square meter/day, and thus, substantial potential exists for harvesting renewable solar energy.

In the long run, electricity generation through fuel will be more expensive compared to solar powered lighting system with white LEDs. Solar lighting system with a smart charge controller developed in this work is an ideal solution to light remote houses. Except for the initial cost, there will not be no other bill to settle.

The smart charge controller designed here is specially developed for a battery charging application. The charging current is used to change the duty cycle of the dc/dc converter control signal. This smart charge controller is developed using low cost, low power consumption PIC16F877A microcontroller. The PIC microcontroller gives design flexibility. In this smart charge controller used Maximum Power Point Tracking (MPPT) techniques.

The results presented in this thesis show that the MPPT process has increased the charging current. The measurements show that percentage increase in charging current comparing to the 12.5 V regulations is above 112% (on average) even under cloudy conditions.