An Experimental Approach in Determining The Usability of A Photo-voltaic Street Light Pole

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***Abstract*—This article proposed a new approach in determine the suitability of a photo voltaic street light pole for installation in a certain area.**

INTRODUCTION

In entire world there are more than 300 million of street lights, which emits 100 million tons of carbon dioxide per year. 40% of energy is wasted which costs around 20 billion dollars. Therefore for economical operation of street lights and reduction of carbon footprints, High efficient LED luminaire with smart control of illumination level is the demand and need of time. About India, India consumes 18% of electricity for street lighting and residential lighting in which street lighting takes major part, while India is facing shortage of electricity. In December 2014, Government of India proposed and started to use LED luminaire in streetlights. If all existing streetlight replaced with LED lights then India will be benefited by 5,500 crore of rupees every year and reduction in CO2 emission. This is beneficial by many aspects like economic, environmental, lighting performance, reduction in road accidents, thief and crime. According to statistical data, for residential lighting, every year in India 77 crore of incandescent, fluorescent bulb and 40 crore of CFL bulb are purchased, which consumes around 60 to 100 Watts and 30 to 40 Watts of power respectively, which lasts for one to maximum four years only. Therefore use of efficient, long lasting 10 to 15 year LED lights would be wise decision. LED is considered a promising solution to modern street lighting system due to it is behavior and advantages as emphasized in [1]-[3]. apart from that, the advantages of LED are likely to replace the traditional street lamp such as the incandescent lamp, fluorescent lamp and High Pressure Sodium Lamp in future but LED technology is an extremely difficult process that requires a combination of advanced production lines, top quality materials and high-precision manufacturing process. Therefore, this paper highlights the energy efficient street lighting design using LED lamps through intelligent sensor interface for controlling intensity of light [10]. Still today almost all street lights are switched manually and thus due to manual error they are not switched at proper time, sometimes streetlights are remains ON during daytime. Therefore time based streetlights are also used to turn on and off on preset time, but still this method has disadvantage due to seasonal differences in time of sunset and sunrise.

The above problems of switching can be avoided using light sensor based streetlights in addition with to turn on in heavy rain and cloudy environment. In addition of this use of motion sensor allows controlling light intensity which ensures energy saving and economical. The proposed smart solar LED streetlight can be operated free of cost with sufficient solar charging. The system can be made more reliable by using auto changeover technique; in which streetlight is automatically switched to utility supply if there is insufficient charge in battery storage. The battery starts charging in daytime via PV solar panel. With the help of light sensor (LDR), in dusk, streetlight automatically turns on with 30% of intensity and battery starts discharging. If there is any movement of vehicle or person then intensity of light will increase from 30% to 100% for preset time period. After this preset delay intensity will gradually reduce to 30%. In-between this if any movement is detected then again intensity will increase to its maximum. This ensures optimum lighting as well as energy saving. With this automation technique, capacity (Ah) of battery required is much less a compared to conventional solar LED streetlight. The Arduino microcontroller receives command signal from LDR light sensor, motion sensor and charge controller and controls streetlight according to program loaded into it.