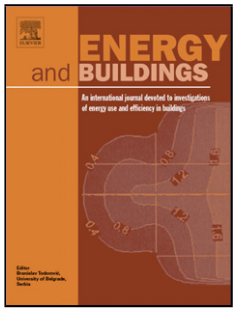

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COMPARATIVE STUDY OF LIGHTING QUALITY AND POWER QUALITY FOR LED AND HPS LUMINAIRES IN A ROADWAY LIGHTING SYSTEM

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Roadway lighting was one of the earliest applications for electric lighting technologies. Well-designed roadway lighting offers many benefits and aids the visual tasks of drivers and pedestrians. Currently, the trend of energy management for exterior general lighting has increased in several cities. Generally, high-pressure sodium (HPS) lamps have been the standard throughout Thailand since the 1980s, but the use of HPS lamps has driven high energy consumption. To conserve energy, light emitting diode (LED) street lighting has quickly become a new trend. The primary objective of this paper is to deliver an initial and in-depth assessment of LED technology for roadway lighting applications. This analysis focuses on the performance of LED luminaires compared with the existing standard of HPS cobra-head luminaires in terms of lighting quality, energy savings, power quality, and investment. The analysis is conducted via three components. First, simulation of the roadway lighting quality is performed using the DIALux programme to evaluate and compare with the standard of Thailand. Second, an experimental setup is used to evaluate the energy savings and power quality for cases with and without solar power. Third, the discounted payback period (DPP) criterion and internal rate of return (IRR) are applied to evaluate the investment scenarios. The obtained results conclude that the LED luminaire performs better than the HPS luminaire in terms of power quality and energy savings (energy-efficient index reduction of approximately 40% over the HPS luminaire), which indicates that the utility benefits from use of LED luminaires. However, although the lighting quality results for LED luminaire have values fairly close to that of the standard, the lighting quality should be improved in terms of uniformity. The results obtained from this analysis are expected to help to improve the roadway lighting standard of Thailand in the future.