

Highway Lighting of the 21st Century is Smart, but is it Cost Efficient?

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Abstract : It is known that the adoption of solar powered LED highway lighting systems or sensory LED highway lighting systems can dramatically reduce energy consumption by 55 percent when compared to conventional on-grid High Pressure Sodium (HPS) lamps that are widely applied to most highways. However, an initial high installation cost for building the infrastructure of solar photovoltaic devices hampers a wider adoption of such technologies. This research aims to examine currently available state-of-the-art solar photovoltaic and sensory technologies, identify major obstacles, and analyze each technology to create a benchmarking metrics from the benefit-cost analysis perspective. The on-grid HPS lighting systems will serve as the baseline for this study to compare it with other lighting alternatives such as solar and sensory LED lighting systems. This research will test the validity of the research hypothesis that alternative LED lighting systems produce more favorable benefit-cost ratios and the added initial investment costs are recouped by the savings in the operation and maintenance cost. The payback period of the excess investment and projected savings over the life-cycle of the selected lighting systems will be analyzed by utilizing the concept of Net Present Value (NPV). Researchers believe that if this study validates the research hypothesis, it can promote a wider adoption of alternative lighting systems that will eventually save millions of taxpayer dollars in the long-run.

Keywords : lighting systems, sensory and solar PV, benefit cost analysis, net present value

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