Pacific Northwest Laboratory's Lighting Technology Screening Matrix

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Introduction

Pacific Northwest Laboratory[1] has developed the Lighting Technology Screening Matrix (LTSM), a tool to screen alternative lighting retrofit technologies according to life-cycle cost. The LTSM can be used to evaluate retrofits for most configurations of fluorescent, incandescent, high-intensity discharge, and exit lighting systems for any level of operation, electricity price, discount rate, and utility rebate. The screen was developed in support of the Federal Relighting Initiative to assist federal government facilities in their efforts to comply with mandated life-cycle costing for energy equipment investments. This paper describes the LTSM and demonstrates its application in a case study at a federal installation.

The LTSM is a DOS-based software tool that calculates the life-cycle cost of an existing fixture and of a large number of potential energy-efficient replacements, both for one-on-one replacements and on a lumen-equivalent basis. The LTSM calculates annual energy savings of the replacements, annualized capital costs, annualized maintenance costs, and annualized energy costs. These cost elements are then combined to calculate the life-cycle cost of the fixtures. The optimal replacement is the fixture with the minimum life-cycle cost.

The LTSM was recently used in the estimation of the energy savings potential at Fort Drum in Watertown, New York. The LTSM identified minimum life-cycle cost replacements for fluorescent fixtures, incandescent fixtures, exit signs, and high-intensity discharge fixtures. The LTSM allowed the use of electricity prices specific to Fort Drum, including off-peak and on-peak price variations. The LTSM also allowed the use of varying operating schedules for different types of buildings for each type of existing lighting technology. Total lighting energy savings estimated for Fort Drum amounted to over 16 million kWhs annually, with an annual value at current electricity prices of nearly $900,000. These estimates assume no cost-sharing by Fort Drum's electric utility. If the utility were to agree to pay 50% of the cost of a retrofit program, the level of energy savings that would be cost-effective from the Fort's perspective would be nearly 18 million kwhs annually, with an annual value at current electricity prices of approximately $1 million. The increased savings available when the utility subsidizes the program is a result of higher efficiency replacements becoming cost-effective for the Fort.

The LTSM is useful for demonstrating the impact of critical operating parameters on the optimal technology choice. The optimal technology varies according to the price of electricity, the annual hours of operation of the existing lighting fixture, and the level of utility cost-sharing. The choice of the optimal technology is especially volatile at relatively low electricity prices, which frequently characterize large federal installations.

Endnote

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