Illuminating
ENGINEERING SOCIETY

IES LEM-3-13

IES Guidelines for **Upgrading Lighting Systems in Commercial and Institutional Spaces**

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The content of this Lighting Energy Management publication has been approved by the IES.
Suggestions for revisions should be directed to the IES.

Prepared by:
The IES Energy Management Committee

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1.0 INTRODUCTION

Increasing lighting efficiency is often the most cost effective energy efficiency improvement that can be made to an existing building. There are two basic approaches for improving the energy efficiency of an existing lighting system: *retrofit* or *redesign*. Retrofitting the existing luminaires will be the more common approach. However, on projects where the existing illumination or lighting equipment no longer suits the space or application, redesign is the better choice. A thorough assessment is necessary to determine if one (or both) of these methods is advantageous over the other.

When upgrading lighting in any space, it is important to know the recommended practice and illumination levels for the occupant programming. The IES publishes many standards on lighting applications, and a competent lighting practitioner/designer may be able to help with specifying accepted illumination levels in the building. There may be a nominal cost, but it is a sound investment to get the lighting upgrade project right the first time. When working on a lighting upgrade project, one must always be aware of the delicate balance between *quality lighting* and *energy savings*. When too much focus is placed on energy savings, quality may suffer.

1.1 Audience

This document is intended for commercial and institutional building owners, lighting practitioners, managers, facility engineers, energy service companies, retrofitters, and utility representatives considering a lighting upgrade.

This document is written in general terms; every lighting project is a little different because of the wide variety of architectural and luminaire styles.

According to the U.S. Department of Energy Buildings Energy Databook, 2010, lighting systems often consume about 20% of the electrical energy used by the building, depending on the type of building, location, age, and other factors.[1] A lighting upgrade generally offers one of the most cost-effective and easy means to reduce operating costs with a return on investment that is acceptable to the financial managers of the facility. However, appropriate illumination levels and light quality must also be achieved along with the energy savings. **Figure 1** illustrates why it is imperative to not lose employee productivity in the name of energy savings. If completed properly, a lighting upgrade may actually increase occupant productivity!

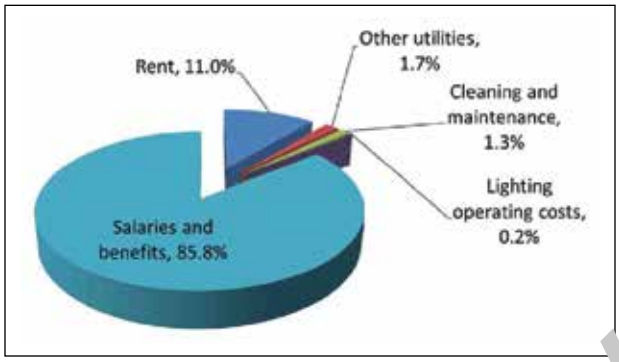

Figure 1. Average office costs show the importance of maintaining employee productivity. (Graphic courtesy of Elizabeth Gillmor)

1.2 Lighting Upgrade: Retrofit or Redesign?

The two basic ways to improve energy efficiency for an existing lighting system are retrofit and redesign. A retrofit, due to financial considerations, is the usual type of upgrade. Sometimes, however, it may make more sense to do a redesign. It is important to assess as soon as possible which process will be the most effective; it may be that both strategies are required in different parts of the same project.

Retrofit is a method to modify a lighting system to lower the operating costs and/or improve the performance of that system based on efficiency and the task performed.

- *Redesign* is a method to modify a lighting system which will intentionally modify the goals of the existing lighting design. This may include an entirely new lighting distribution pattern, relocating and installing new luminaires and new circuits and controls to meet the new objectives.

While this document concentrates primarily on the retrofit process, concepts will be presented that may also be useful in redesign projects.

A lighting upgrade may result in energy savings when one or more of the following situations exist:

- Older technologies such as T12 fluorescent lamps and magnetic ballasts or older HID (high intensity discharge) systems such as mercury vapor or probe start metal halide are in place
- Illumination levels are too high
- Glare is a problem
- Inefficient optical components such as lenses, louvers or reflectors are used in the luminaire