



**LIGHTING PRACTICE:
SUSTAINABLE LIGHTING –
AN INTRODUCTION TO THE
ENVIRONMENTAL IMPACTS OF LIGHTING
AN AMERICAN NATIONAL STANDARD**

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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 IES.

**Prepared for IES
By the Sustainability Committee**



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Foreword

The IES and the International Association of Lighting Designers (IALD) define *sustainable lighting design* as “meeting the qualitative needs of the visual environment with the least impact on the natural environment.” Visually effective and appealing, high quality lighting provides the greatest environmental and economic value. The intent of this Lighting Practice (LP) document is to introduce the topic of sustainability, present its elements, and explain how it affects the design of lighting in process and product.

Sustainable lighting consists of the following elements:

- Optimizing the use of daylighting
- Minimizing the use of energy through integrated design and effective controls
- Reducing light pollution and light trespass
- Minimizing embodied environmental effects
- Specifying environmentally-preferable materials and equipment
- Ensuring system quality, flexibility, adaptability, maintainability, and durability
- Providing for optimum commissioning

It is important that sustainable lighting needs be addressed during each phase of the project:

- *Programming and schematic design:* The building site, massing, and orientation, determined in the earliest design phases, are critical to designing quality daylighting, integrating efficient electric lighting, analyzing accurate energy modeling that anticipates effective controls strategies, and establishing early commissioning performance goals.
- *Design development and construction documentation:* To achieve the desired programmatic results, an integrated lighting scheme needs to be fully designed and specified. Specifications can address environmentally preferable manufacturing attributes such as less toxic material content, proximity to the project site, and recycled or recyclable packaging. Energy and computer modeling can verify performance goals.
- *Construction and commissioning:* The person responsible for the lighting design can best

respond to lighting information requests and substitution proposals. The commissioning process should include a full evaluation of the lighting and control installation to ensure that optimal performance will be realized to meet goals for energy efficiency and system integration. Post-occupancy commissioning and measurement can evaluate occupant satisfaction and verify or enforce achievement of performance goals and occupant satisfaction.

In this LP, design and application guidelines have been included for these topic areas:

- Lighting quality
- Optimizing the use of daylighting
- Lighting and health
- Light pollution
- Maximizing energy efficiency
- Ensuring system flexibility, maintainability, and durability
- Providing commissioning
- End-of-life phase, demolition, disposal, and recycling or reuse considerations

1.0 Introduction and Scope

1.1 Introduction

Sustainability is an essential environmental, economic, and social issue representing the next natural progression in lighting standards and practice.

Applying sustainability to lighting design requires reevaluation of many systems choices in terms of their potential impact on the environment. Lighting systems affect the environment in a variety of ways. For example, lighting accounts for 26% of commercial building electricity demand in the U.S.¹ The percentage of source fuels varies significantly from state to state; however, overall in the U.S., 45% of this electricity is generated through the combustion of coal and another 23% by natural gas.² Both methods emit CO₂ and other greenhouse gases into the atmosphere, contributing to climate change. Carbon dioxide (CO₂) emissions from coal-fired electricity generation comprise nearly 80%