

### Sustainable buildings need Sustainable Lighting

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### Environmental Concern

- 20% of the world's energy costs are towards Lighting
- More than 80% of current lighting in use in the world is based on antiquated technology which consumes more energy and indirectly causes more CO2 emissions
- Even if we convert 20% of the current lighting to energy efficient lighting, we will save nearly 50 Billion Euro globally in energy costs
- Hazardous materials in lamps (Mercury) also have to be kept within limits to prevent polluting our ecosystems
- Latest lighting solutions can help save our environment

### Sustainable Development

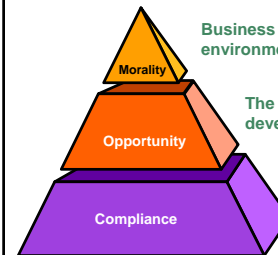
- Corporate environmental attention and compliance is growing at a very fast pace
- Environmental decision making is made at a higher level in most organizations
  - Top down directive to "buy green"
  - Value Creation
  - Long term enduring customer relationships

The world in general and businesses in particular are graduating from environmental awareness to 'sustainable development'.

### Sustainable Development .....

Growth that meets economic, social, and environmental needs without compromising the future of any one of them.

#### Why are Companies turning to Sustainable Practices ?



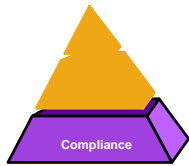
Business owes it to society to improve people's lives and the environment in exchange for the privilege to operate.

The value of SD as a driver of innovation, new market development, and new technology is just emerging.

Legal requirements will remain a major driver of business investment in the environment for years to come.

### Elements of Sustainable Lighting

Most efforts in Lighting are starting off with the need to comply



- Energy efficiency
  - Meeting or exceeding visual performance while optimizing energy utilization (ie. Lumens/watt)
- Impact on the Physical Environment - Life Cycle Assessment (LCA)
  - Lighting products have the least impact on the physical environment at optimum performance levels. (Resource depletion, environmental toxicity, source reduction, etc.)
- Light Pollution -
  - Encroachment/Negative impact of lighting on night skies

Sustainability is just beginning to emerge as a key issue in the lighting industry and we expect these elements to evolve further

### A Comprehensive response to Sustainability

Energy Efficiency

- Daylight harvesting - Dimming
- System Solutions

Impact on Environment

- Acid rain
- Global warming
- Acidification
- Resource depletion
- Environmental toxicity (mercury, lead, etc..)
- Source Reduction - Long Life - Packaging
- Lamp recycling

Light Pollution

- Dark Sky Initiatives

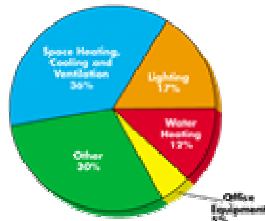


Most of the efforts of the Lighting Industry have been focused on Energy Efficiency

### SUSTAINABLE LIGHTING Energy Efficiency

- Lighting consumes approximately 17 - 20% of energy requirements
- Sustainable energy efficient lighting reduces global warming by reducing energy requirements

#### Energy Offenders For Businesses



Lighting falls into the second largest energy offender category

Source: Department of Energy

### SUSTAINABLE LIGHTING Energy Efficiency

- |                                       |              |
|---------------------------------------|--------------|
| • INCANDESCENT LAMPS                  | 10-15 Lum/W  |
| • HALOGEN LAMPS                       | 15-20 Lum/W  |
| • SSL LIGHTING                        | 25-65 Lum/W  |
| • COMPACT FLOURESCENT (CFLs)          | 65-85 Lum/w  |
| • FLUORESCENT LAMPS                   | 70-105 Lum/W |
| • MERCURY VAPOR                       | 60-70 Lum/W  |
| • HIGH PRESSURE SODIUM & METAL HALIDE | 80-110 Lum/W |
| • LOW PRESSURE SODIUM                 | 200 Lum/W    |



Lamp Technologies vary in efficacy

### SUSTAINABLE LIGHTING Energy Efficiency

- Use most energy efficient light source consistent with application
- Halogen, Compact Fluorescent for incandescent
- T-5 & T-8 lamps for T-12 (electronic ballasts for electro-mechanical)
- Metal Halide or QL or other induction lighting for mercury vapor

Matching Light sources with application is critical for energy efficiency

### SUSTAINABLE LIGHTING Lamp Performance - Longer Life

- Fluorescent extended rated life
  - Universal T8 20,000 hrs (all ballast types)
  - Advantage - Plus T8 24,000 hrs
- Induction Lighting 100,000 hrs
- Halogen longer life of 2-3 versus incandescent
- Longer life products reduce
  - Lamps to landfills
  - Packaging
  - Transportation emissions

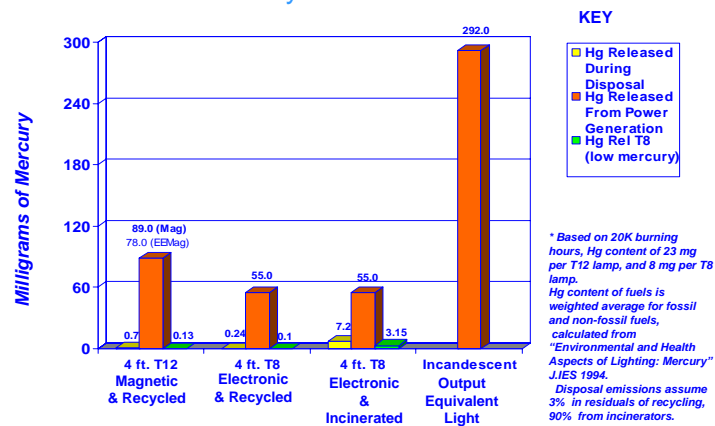
High performance longer life lamps are a key element in source reduction!

### SUSTAINABLE LIGHTING Impact of Energy Efficiency on Mercury Reduction

- What is the the largest contributor of mercury into the environment?
- Coal fired energy plants contribute the greatest amount of mercury into the air!

Energy Efficient Low mercury lamps have the least amount of impact on the Environment!

### Lifetime Mercury Emissions



### SUSTAINABLE LIGHTING Impact of Energy Efficiency on Mercury Reduction

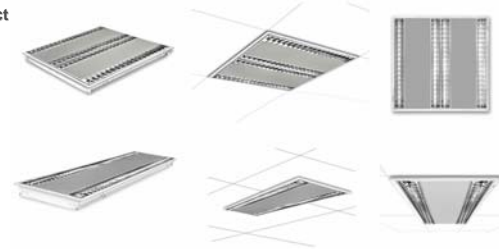
- Mercury (Hg) from lamp disposal is small compared to Hg released from power generation required to operate lamp
- Incandescent lamps contain no mercury but result in the highest Hg emissions
- Energy Efficiency combined with reduced toxicity creates optimal solution for sustainable lighting

### Sustainable lighting requires high efficiency luminaires

High efficiency optics direct lamp light towards workplane for maximum DLOR.

DLOR can be from 55% - 75% for good luminaires

Glare is minimized to prevent user discomfort



### Sustainable lighting requires high efficiency luminaires

High efficiency optics direct lamp light upward and downward for maximum efficiency and comfort

Total LOR can be from 65% - 82% for good luminaires



### Leadership in Energy & Environmental Design (LEED™ - USGBC)

A leading-edge system for designing, constructing, and certifying the world's greenest buildings.

### Why Was LEED Created?

- Use as a design guideline
- Recognize leaders
- Stimulate green competition
- Establish market value with recognizable national “brand”
- Raise consumer awareness
- Transform the marketplace!



### Technical Overview of LEED

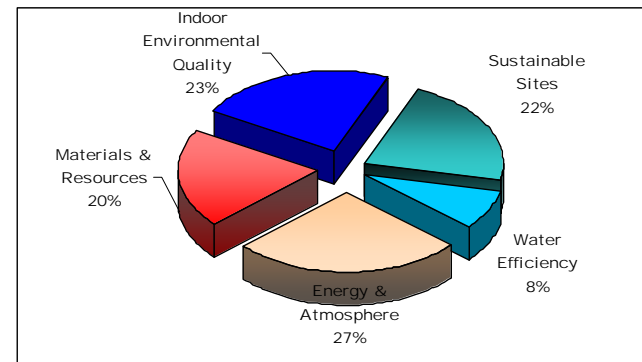
- Green building rating system, currently for commercial, institutional, and high-rise residential new construction and major renovation.
- Existing, proven technologies
- Evaluates and recognizes performance in accepted green design categories
- LEED 3.0 product development includes existing buildings, multiple buildings, core & shell, interiors, and residential



### Technical Overview of LEED (continued)

- Whole-building approach encourages and guides a collaborative, integrated design and construction process
- Optimizes environmental and economic factors
- Four levels of certification
  - LEED Certified 26 - 32 points
  - Silver Level 33 - 38 points
  - Gold Level 39 - 51 points
  - Platinum Level 52+ points (69 possible)

### LEED Point Distribution



Five LEED credit categories

## Sustainable Development

- Corporate environmental attention is growing at a very fast pace
- Environmental decision making is made at a higher level in most organizations
  - Top down directive to “buy green”
  - Value Creation
  - Long term enduring customer relationships
- Educating end users is a must
- Compliance initiatives must be implemented to establish standards

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Thanks