Advances in Lighting Controls and the Impact of ASHRAE Requirements

Rich Rattray, LC
OSRAM SYLVANIA
What are “Addressable Lighting Controls”?  
- The ability to address and control each fixture or peripheral device (such as occupancy sensors, photo sensors and wall controllers) individually.  
- All devices (each with a unique address) are networked and centrally controlled through a central software interface.
Conventional Lighting Controls: Limitations

- No ability to address & control individual fixtures
  - Zoning restricted to lighting circuiting

- No workspace or task specific control
  - i.e. tuning light levels based on use

- Lack of centralized “intelligence” to allow deployment of combined energy management strategies

- Limited ability to integrate or share data with other building systems such as HVAC, Security and Fire
Energy Management Strategies

2 TO 5 YEAR SIMPLE PAYBACK
Smart Time Scheduling

With time scheduling, lights in a facility can be turned “ON”, “OFF”, or “DIMMED” according to day, night, holiday and other schedules.

- Lights can be scheduled to be turned on/off by zones as small as an office, workstation or even a light fixture.
- When used as a standalone strategy can save 15% - 25% of lighting energy.
With daylight harvesting, lights are dimmed or switched in response to sensed ambient light levels.

As daylight levels fall off, dimming levels of individual fixtures are adjusted so that total illumination is evenly maintained throughout the space at the required level.

When used as a standalone strategy can save 20% - 50% of lighting energy.
“Tuning” or setting default light levels to suit the particular task or use of a workspace

- Light levels are “tuned” fixture by fixture throughout a facility (through dimming), thereby eliminating over-lighting.

When used as a standalone strategy can save 10% - 25% of lighting energy
Occupancy Control

Occupancy sensors switch the lights “OFF” when the space is not occupied and switch the lights “ON” when the space is occupied.

When used as a standalone strategy can save 20% - 45% of lighting energy.
Conventional occupancy controls a group of ballasts typically on one circuit or switch leg.

With addressable lighting controls,

– Lights are automatically turned “ON”, “OFF” or “DIMMED” based on occupancy detection (independent of electrical circuiting)
– Soft association of sensors to fixtures via software
– Allows for overlapping and support zones
– Can share real time occupancy data with other building systems via BACnet® or Tridium interface
Personal Control

- Personal lighting controls allows “ON/OFF” switching or dimming using virtual slide dimmers located on the occupant’s computer or IP phone.

- When used as a standalone strategy can save 7% - 23% of lighting energy.
Variable Load Control

- System automatically executes load shedding in response to energy price spikes or to reduce peak demand
  - System can respond to information from a demand meter, a utility demand response signal, or a signal from building or energy management systems

- When used as a standalone strategy can save 15% - 25% of lighting energy
## Industry Case Studies

<table>
<thead>
<tr>
<th>Energy Management Strategies</th>
<th>Lighting Energy Savings Due to Addressable Lighting Controls</th>
<th>Average Savings by Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Multi-Tenant office building (300,000 ft.²)</td>
<td>Headquarters of a major entertainment company (400,000 ft.²)</td>
</tr>
<tr>
<td>Smart Time scheduling</td>
<td>13.91%</td>
<td>8.91%</td>
</tr>
<tr>
<td>Daylight Harvesting</td>
<td>0.60%</td>
<td>3.96%</td>
</tr>
<tr>
<td>Task Tuning</td>
<td>9.0%</td>
<td>10.95%</td>
</tr>
<tr>
<td>Occupancy Control</td>
<td>31.3%</td>
<td>24.94%</td>
</tr>
<tr>
<td>Personal Control</td>
<td>6.12%</td>
<td>10.64%</td>
</tr>
<tr>
<td>Variable Load Control</td>
<td>0.03%</td>
<td>4.65%</td>
</tr>
<tr>
<td>Cumulative savings due to Addressable Lighting Controls</td>
<td>60.96%</td>
<td>64.05%</td>
</tr>
</tbody>
</table>
Additional Advantages

Energy Demand History
(by space, by hour, day, week, month, year)

Energy Savings by Strategy
Conclusions – Addressable Lighting Controls

- Addressable dimming lighting controls, on the other hand,
  - Allow simultaneous use of all six energy management strategies by using networked addressable controls (50 – 75% energy savings)
  - Allow the entire control system managed through graphical user interface (GUI) based front-end software (easy to re-zone and change)
  - Contribute towards LEED points (12 - 18 points) in multiple categories
  - Improve workplace ergonomics by providing the right amount of light where and when required
ASHRAE/IES 90.1 Standard Update

(American Society of Heating Refrigeration & Air Conditioning Engineers)

(Illuminating Engineering Society)
## Hospitality: ASHRAE 90.1

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Maximum Lighting Power Density (W/sq.ft.) Allowed Per Version of the ASHRAE/IES 90.1 Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dining: Bar Lounge/Leisure</td>
<td>1.5</td>
</tr>
<tr>
<td>Dining: Cafeteria/Fast Food</td>
<td>1.8</td>
</tr>
<tr>
<td>Dining: Family</td>
<td>1.9</td>
</tr>
<tr>
<td>Hotel</td>
<td>1.7</td>
</tr>
<tr>
<td>Motel</td>
<td>2</td>
</tr>
</tbody>
</table>
Hospitality: EPAct

• Hospitality, especially hotels, are great candidates for EPAct Tax Deduction

  - For lighting only – must exceed ASHRAE 90.1-2001 w/sq.ft. by
    • 25% = $.30/sq.ft. tax deduction
    • 40%=$.60/sq.ft. tax deduction

<table>
<thead>
<tr>
<th></th>
<th>Bar</th>
<th>Cafeteria</th>
<th>Dining Fam.</th>
<th>Hotel</th>
<th>Motel</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1.5</td>
<td>1.8</td>
<td>1.9</td>
<td>1.7</td>
<td>2</td>
</tr>
<tr>
<td>2010</td>
<td>.99</td>
<td>.9</td>
<td>.89</td>
<td>1</td>
<td>.88</td>
</tr>
<tr>
<td>25%</td>
<td>1.125</td>
<td>1.35</td>
<td>1.425</td>
<td>1.275</td>
<td>1.5</td>
</tr>
<tr>
<td>40%</td>
<td>.9</td>
<td>1.08</td>
<td>1.14</td>
<td>1.02</td>
<td>1.2</td>
</tr>
</tbody>
</table>

• Combine HVAC with lighting for up to $1.80/sq.ft. tax deduction
ULTRA LED Lamps & Downlight Retrofits
CONTACT INFORMATION

Rich Rattray, LC
OSRAM SYLVANIA
Specification Sales Engineer
Northeast
Phone: (978) 376-6673
richard.rattray@sylvania.com