Advanced Lighting Control for High Building Performance

Better Buildings by Design
Why Advanced Lighting Controls?

• Greater energy savings potential versus traditional lighting efficient techniques
• Incorporates all six lighting control strategies to work in concert
• Software based advanced lighting controls provide:
  − Complete snapshot of your building’s lighting energy usage in a multi-floor view
  − Advanced energy reporting features to identify lighting inefficiencies and demonstrate energy savings
• Contributes up to 19 points toward LEED® certification
• Overall, improves comfort for building occupants, leading to an increase in satisfaction and work productivity
Six Control Strategies

64% average energy savings attaining through six strategies, synergies and deep commissioning
Energy Management Strategies

SMART TIME SCHEDULING

- Light scheduling configurable by floor, department, room, zone or even a light fixture
- Lighting schedules are automatically extended in the event that after hours occupancy is detected via the “virtual occupancy sensor” feature (detects PC activity)
- Office occupancy can override to keep hallways lit at night
- Easy to use drag & drop calendar
- Built on Microsoft Outlook platform
- Possible savings: 10-30%
Software

Time Scheduling
Energy Management Strategies

OCCUPANCY CONTROL

- Lights are automatically turned on or off based on occupancy detection (independent of electrical circuiting)
- Association of sensors to fixtures via software
  - Allows for overlapping and support zones
  - Reconfigure without rewiring
- Occupancy signal can switch or dim lights – bi-level for stairs and corridors
- Share real time occupancy data with HVAC systems
- Possible savings: 15-90%
Energy Management Strategies

**DAYLIGHT HARVESTING**

- Lighting levels are automatically adjusted to take into account ambient natural sunlight through windows or skylights.
- Level of daylight harvesting varies based on proximity of fixture to window.
- Association of sensors to fixtures via software.
- Reconfigure without rewiring.
- Adjust aggressiveness with software.
- Possible savings: 35-60%
Energy Management Strategies

PERSONAL CONTROL

- Occupants can control light levels in their workspace from their PC, create personal presets for reading, computer work, meetings, etc.
- Each light fixture can be dimmed or turned off individually allowing users ultimate flexibility in setting preferred light levels.
- PC is used as secondary form of occupancy sensor.
- Significant contributor to energy savings as most users dim lights below default light levels.
- Possible savings: 5-20%
Energy Management System Hardware

Three-Scene Dimming Control Wall Station
• Recall of three scenes per zone, ON/OFF functionality and manual dimming
• More scenes allowable with multi-scene configurations

Three-Zone Control Wall Station
• Manual switching lighting controller that provides local ON/OFF control over three lighting zones.
Personal Control Software

- Available to each occupant in a building to control lighting in their workspace
- Allows dimming, on/off control and pre-set scene selection
- Can be configured as PC based software application or via web browser interface
- Also can be used to control light levels in larger spaces, such as boardrooms, conference rooms or auditoriums
Personal Control Software

Personal Control Settings
- Sampling of 36 private offices
- 7.61% Savings over 720 users
- Voluntary energy savings and greater employee comfort
- At $500 per sq ft, how much is it worth?
Energy Management Strategies

TASK TUNING

- Requires dimming AND advanced control system
- Without Task Tuning, lights are set at 100% light output 100% of the time
- Set light levels to suit the area or task to the "new 100%"
- Light levels are “tuned” by individual fixture throughout a facility (through dimming or addressable switching) to meet required light levels
- Save $ when the lights are ON
- Possible savings: 5-10%
VARIABLE LOAD SHEDDING

- Requires dimming AND advanced control system
- Your customers are paying big dollars in peak demand charges
- System automatically executes load shedding to reduce demand peaks or to meet specific demand response goals
- Lights are dimmed selectively by lowest priority areas first
- Sheds load in a manner that is transparent to occupants (i.e., configurable fade rate)
- Responds to a demand meter, a utility demand response signal, or a signal from building or energy management systems
# Energy Management System Overview

Six energy management strategies seamlessly integrated

<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 bldg 300K ft²</td>
<td>HQ of Fortune 100 firm 400K ft²</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>
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<tr>
<td>Task Tuning</td>
<td>9.0%</td>
<td>10.95%</td>
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<tr>
<td>Occupancy Control</td>
<td>31.3%</td>
<td>24.94%</td>
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<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>
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<tr>
<td>Cumulative Savings due to Addressable Lighting Controls</td>
<td>60.96%</td>
<td>64.05%</td>
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</tbody>
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Consumption Savings & Demand Reduction

Analysis for 1st Encelium Place


Quarter 4, 2011 | Quarter 1, 2012

Unit: %
Energy price: 0.25 $/kWh
Demand price: 4 $/kW

Consumption Savings and Demand Reduction by strategy compared to pre ECS installation, averaged over 2011-09-05 to 2012-02-19

Consumption Savings

- Consumption under ECS: 28.85%
- Savings by TT: 5.08%
- Savings by PC: 8.26%
- Savings by TS: 2.81%
- Savings by OCS: 15.65%
- Savings by LS: 2.81%
- Savings by DLHV: 2.81%

Demand Reduction

- Demand under ECS: 28.85%
System Capabilities

- Look for systems that are capable of switching or dimming light loads
- Look for systems that are capable of individual fixture control or zone control to meet end user budget
- Look for systems that offer the ability to control any lighting load including traditional (fluorescent, HID, induction, etc) or SSL (LED)
- Energy reporting capability is critical!
Traditional Lighting

Including Fluorescent and HID Lamps and Ballasts
Solid State Lighting (LED)

LED Retrofits

TLED

LED Luminaires
LED Technology

LEDs will make up 70% of the global lighting market by 2020*

- Lower energy usage and larger life spans contribute to significantly lower operational costs
- LEDs may be able to replace all other types of light fixtures
- LEDs are continuously becoming dimmable out-of-the-box
  - Will decrease incremental costs of implementing lighting controls

Second Edition/August 2012
NEMA SSL 7A-2013: LED Lamp and Dimmer Compatibility Standard

Standard for phase-cut dimming of LED lamps & light engines

Phase-cut is most popular type of dimmer
• Low cost to manufacture
• Low cost to install: uses the same wires for both power and control

Developed by NEMA and published April 2013
www.nema.org/Standards/Pages/Phase-Cut-Dimming-for-Solid-State-Lighting-Basic-Compatibility.aspx

Global: 50/60 Hz, 100/120/230/277 Vac

Forward-looking
• for new dimmers and lamps
• not intended for the installed base of incandescent dimmers, which are covered by NEMA SSL 6

7A covers basic compatibility and safety but does not cover performance

7B will address performance issues including flicker, noise, wide dimming range, etc.
Thank you for your attention.

For more information, contact:

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