



Green Electrical Upgrades Reduce Commercial Building Operating Costs

Specifying green electrical solutions

Because of the many energy-efficient alternatives available, the electrical industry is well-positioned to play a central role in reducing the cost for electricity in commercial, office, retail, and institutional buildings. This guide is designed to help stimulate the planning of energy-efficient electrical solutions between electrical specifiers, contractors, builders, owners, manufacturer's sales representatives, and NAED member electrical distributors.

The LEED® certified building

According to the United States Green Building Council (USGBC), a green building is a structure that is designed, built, renovated, operated, or reused in an ecological and resource-efficient manner. The USGBC has developed the Leadership in Energy and Environmental Design, or LEED rating system as a way to insure that green buildings meet certain objectives.

Through the LEED rating system the design/construction team can accumulate various credits for a building project by meeting specific green, or sustainable, goals such as reducing building energy consumption. Projects achieve Certified, Silver, Gold or Platinum ratings by satisfying standard prerequisites. The percentage of LEED-rated green U.S. commercial/institutional buildings is growing at about 150% per year.

U.S. ENERGY?
CONSUMPTION

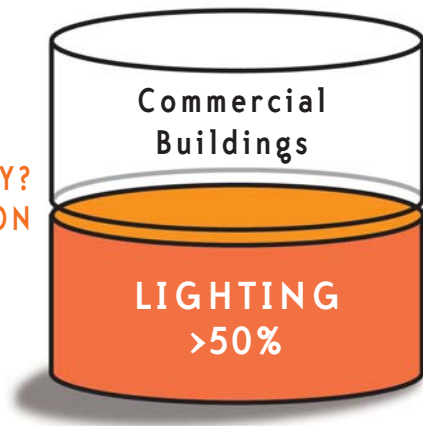


Photo courtesy of Lutron





Maximizing Building Energy Efficiency for Green Construction, Remodeling, or Retrofit Upgrades

Choosing the right electrical systems and technologies for a commercial building can help reduce electrical consumption by 20% to 30%. Consider the following systems and technologies, as well as others in this Guide.

Intelligent building energy management systems

An Integrated Facilities System (IFS) is a compact distribution/metering system that combines distribution switchboards, dry-type transformers, and panelboards in a single, factory pre-wired system, often incorporating lighting control products and intelligent monitoring.

- These high-performance controllers improve power management and energy savings.

Lighting controls, occupancy sensors and dimmers

- Lighting accounts for between 26% to over 50% of a commercial building's energy use.
- Lighting control is the most familiar green electrical solution.

Daylight harvesting systems and window shade systems

- Daylight harvesting controls with motorized window shade systems can boost energy savings by as much as 40%.
- Daylighting also significantly reduces cooling load and peak demand.

Energy-efficient lighting, CFLs and LEDs

- New lighting ballasts, luminaires, and lamps are far more energy-efficient than older systems.
- LED technology is now a highly energy-efficient solution.

Energy-efficient motors, ASDs/VFDs motor controls

- HVAC cooling, fans and pumps use 18% of commercial building energy.
- Motors run these systems, so the use of NEMA Premium® energy-efficient motors to replace older equipment greatly reduces energy costs.
- Variable-Frequency Drives (VFDs), or Adjustable Speed Drives (ASDs), can reduce a motor's electrical current draw by 10% to 50%.

Energy-efficient switchgear, integrated panelboards, and UPS

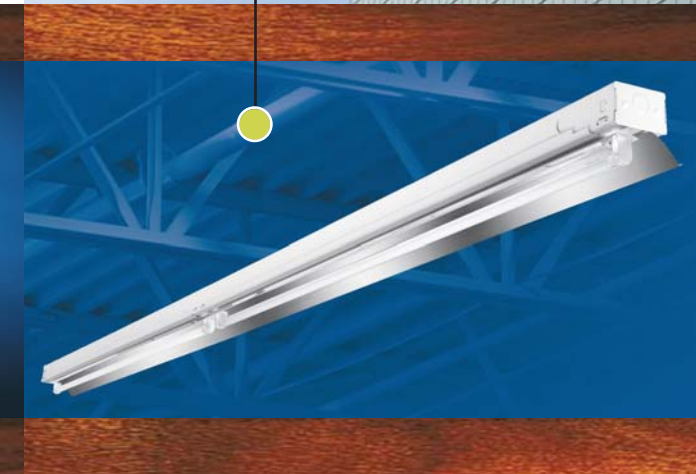
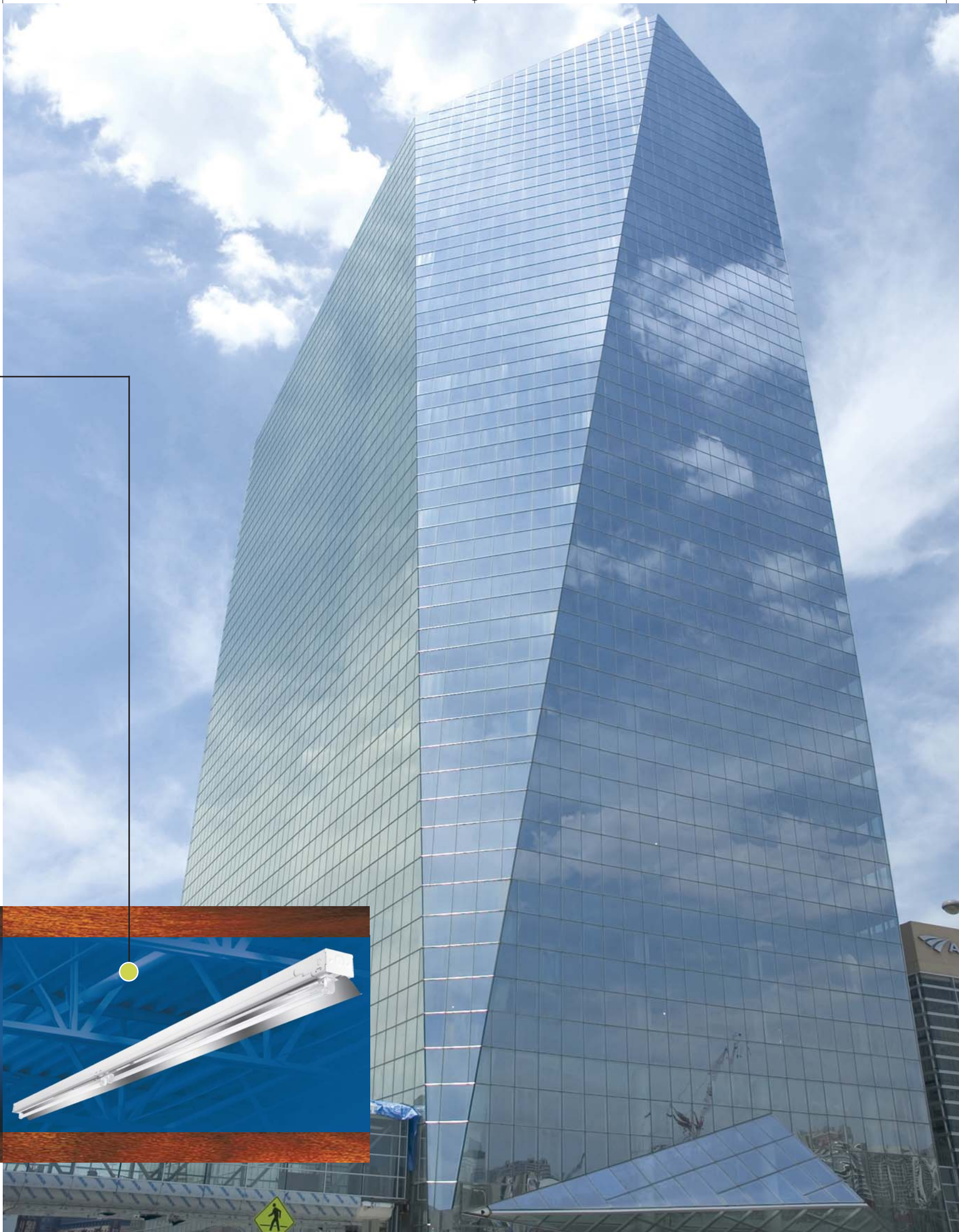
- New power distribution and power conditioning equipment can reduce energy consumption and extend equipment life.

Electrical generation and solar power systems

- Green power generation includes wind turbines and photovoltaic solar-powered panels, and stand-alone photovoltaic (PV) electricity generation systems.

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Energy-Efficient Power Distribution Solutions

Energy-efficient power distribution for commercial facilities emphasizes the use of highly sophisticated integrated systems that combine power handling along with advanced Ethernet/IP-based monitoring controls.

- Provides building owners with previously unavailable energy data.
- Networked monitoring/metering reports a building's energy usage.
- Paralleling switchgear, busway, capacitors and filters, and UPS systems help reduce energy loss and consumption while extending equipment life.



From left to right, small photos courtesy of: Chloride Power, Sola HD Emerson Industrial Automation, GE Consumer & Industrial, Eaton Corporation, and Eaton Corporation. Large photo courtesy of Watt Stopper/Legrand

Electrical power & energy management systems

- Poor quality power can reduce productivity, shorten equipment life and erode profits. A power management system provides the means to understand how best to implement and verify energy-saving initiatives. Systems typically include controllers, I/O, MCCs, drives, and software to help capture, analyze, store, and share real time energy data.
- Provides data that enables facility owner to renegotiate lower electrical rates.
- Prevents costly power quality problems by identifying/correcting power issues.
- Controls demand in order to avoid electrical rate penalties.

Integrated panelboards and integrated switchboards

- Innovative commercial panelboards and switchboards integrate multiple functions within a single pre-wired enclosure.
- Compact solutions allow more space to be used for revenue generating purposes.
- Frequently include sub-metering, lighting control, and energy monitoring equipment bundled together to control energy costs and earn points toward LEED Certification.
- Factory component assembly/wiring reduces labor costs and work site trash.

Paralleling switchgear

- Manages transition from utility power to on-site power sources; make practical use of Combined Heat and Power (CHP) systems to take advantage of otherwise wasted heat energy.

Power factor correction capacitors, filters and NEMA TP-1 transformers

- Lower energy costs by supplying power to loads such as HVAC and elevators upon demand decreasing energy consumption and reducing energy loss.

Uninterruptible Power Systems (UPS)

- Higher efficiency UPSs can result in 50% less power loss while reducing overall building energy costs.

Submetering and monitoring systems

- Electrical submetering and monitoring products allow accurate monitoring of energy usage by building tenant or business unit to support billing and budgeting.
- Systems can be used to track energy consumption of a specific building system or function for data acquisition for use in energy saving and toward LEED® Certification.

Busway/Power bus

Factory pre-wired busway or power bus is delivered in the form of modular units that easily connect allowing the product to be positioned exactly as needed to deliver power.

- Ideal in commercial building offices/educational facilities, which must accommodate high-density worker/student occupancy.
- Under-floor power bus easily distributes building power precisely to the desktop.

Ethernet/IP-based power monitoring

Electrical power monitoring metering hardware and software has grown with the increased interest in reducing energy costs.

- Help building owners determine system areas that can most benefit from energy-efficient upgrades, or monitoring toward LEED® Certification.
- Utilities offer incentive programs that reduce rates for customers.





Lighting & Lighting Control Systems

Lighting accounts for approximately 26% of all commercial building energy costs, and 44% in office buildings. Companies and building owners are realizing that energy-efficient lighting systems and controls are necessary because they directly impact and improve the triple bottom line (People, Planet, and Profits). Lighting and lighting controls also play a major role in meeting LEED prerequisites.

Intelligent lighting control systems and lighting controls

Legislation, including California's Title 21, EAct, and ASHRAE/IESNA Standard 90.1-2004, has made energy-efficient lighting control systems central to energy reduction and cost savings. Sophisticated lighting control systems are scalable to handle projects of virtually any size or complexity, from office and retail complexes and hotels, to campuses, stadiums, and convention centers.

- Centralized lighting control systems provide precise control over switching, dimming, energy management, daylighting and window shade control.
- Systems can control a single space, an entire building, or an entire campus.
- Reduces energy consumption and lowers operating costs while improving occupant comfort and productivity.
- Fluorescent lighting control systems, digital electronic dimming ballasts, controls, and environmental sensors generate energy savings of 50% to 70%.

Dimmers, occupancy sensors, photocontrols and daylighting systems

- Dimming lights by 25% can save 20% of the cost of electricity while extending bulb life by years.
- Occupancy sensors can deliver energy savings of >50% in a classroom, 28% in a private office.

Energy-efficient lamps, T8/T5 fixtures and shatter-resistant lighting

- High-performance T8 lighting systems deliver energy savings of 20% over traditional 3-lamp T8 Parabolic luminaires.
- Fluorescent high-bay luminaires are ideal retrofit for H.I.D. applications that likely consume 25-40% more energy.
- Energy efficient T5 fluorescent lamps and CFLs available as plastic-coated shatterproof safety lamps.

Electronic dimming ballasts and timeclocks

- Dimming ballasts cost more than non-dimming ballasts, but quickly pay for themselves.

Compact Fluorescent Lamps (CFL)

- Energy efficient compact fluorescent downlights (CFLs) provide up to 30% energy savings with lower maintenance costs than standard incandescent lighting.
- Screw-in CFLs save as much as 80% in energy costs.
- Last 10 times longer than standard incandescent lamps.

Light Emitting Diode (LED) lamps and LED exit/emergency lights

- LEDs provide improved brightness, but remain expensive.
- Purchase price is recouped as LEDs last 10 times longer than CFLs and 133 times longer than standard incandescent lamps, reducing maintenance costs.

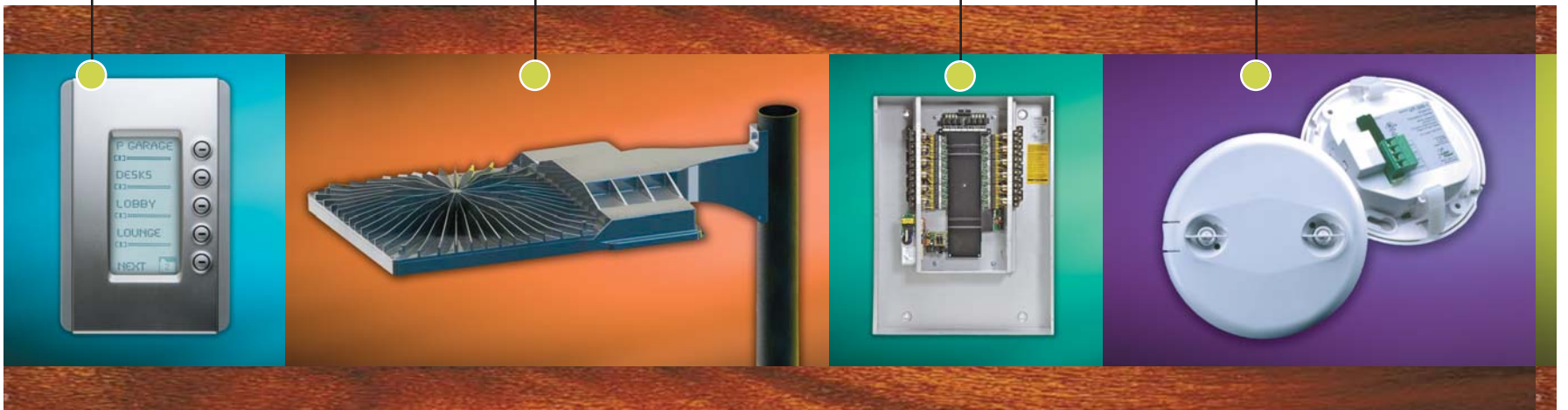
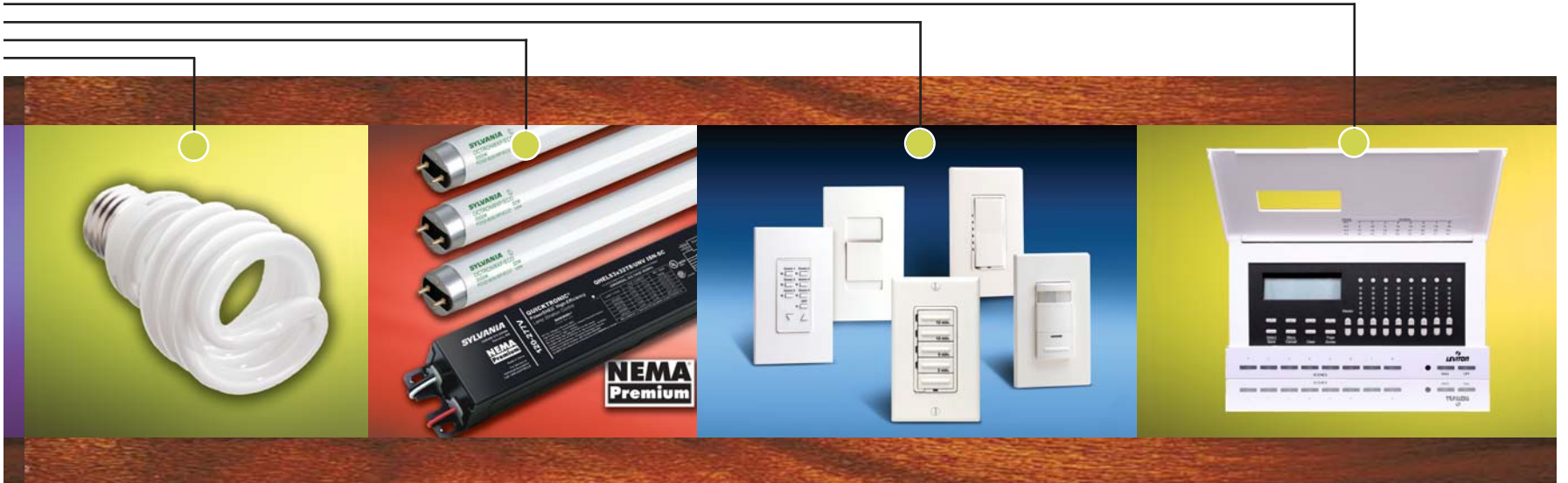




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Building Automation & Communications Systems

Building automation systems reduce commercial building electrical consumption and operating costs by better integrating controls for HVAC, power load and distribution, security, lighting control access and communication. HVAC alone accounts for 30% of commercial building energy use, so it is critical that electrical and HVAC professionals plan jointly.

According to the Green Mechanical Council, a non-profit organization that supports green sustainable construction, energy costs have created a requirement for energy management systems and software in commercial buildings whether they are new design or retrofit.

Building Automation Systems

- Use a Web-based network control center to optimize building energy usage by better managing the building's electrical load.
- Help customers achieve a competitive advantage through operating cost efficiencies, primarily by the reduction of energy consumption and by extending equipment life.
- Include hardware products for power distribution, power quality and power control.
- Include information management software, metering, and gateways.
- Include ethernet network communications infrastructure linking all energy-using systems.

Wireless control systems and VoIP

- Connect building systems controls.
- Carry voice communications via Voice over Internet Protocol (VoIP).
- Reduce need for additional cabling/cable management infrastructure.

Enclosures with cooling

- The need for increased power consumption and greater server density in IT/network environments can be managed with next-generation equipment enclosures with internal cooling systems.

Fiber optic cables

- The smaller outer diameter of fiber optic cables greatly reduces the need for installing additional cable management infrastructure.

Wire and cable with flame-retardant insulation

- Green electrical also includes new cable and wire products with low-smoke producing insulating jackets which produce far less deadly smoke in case of fire.

From left to right, photos courtesy of: Phoenix Contact, Emerson Network Power, and Lutron

