Intelligent Efficiency: Crestron makes life greener™

Green Paper

CRESTRON

CRESTRON Green Light™

Executive Summary

With the only complete integration solution in the industry, Crestron Electronics, Inc. has streamlined technology and reduced energy consumption for the last 40 years. By offering integrated solutions that control and schedule virtually every sub-system and device (including lighting, HVAC, AV, and computer), Crestron intelligently improves the quality and efficiency of life, both at home and at work.

Crestron was a founding member of the Home Lighting Control Alliance (HLCA), an industry council that raises awareness about the value and benefits of residential lighting control. Crestron belongs to the Illuminating Engineering Society (IES), dedicated to advancing lighting controls capabilities and benefits, and participates in the U.S. Green Building Council (USGBC), sharing its expertise and experience in maximizing energy conservation and reducing related costs.

A Crestron solution achieves significant energy savings with fixed or flexible daylight harvesting, and advanced scheduling of lighting and other sub-systems based on ambient light levels, season, time, occupancy, temperature, humidity and other conditions.

To monitor, control, schedule and track assets, Crestron RoomView® software makes it possible to manage lights, thermostats and AV components according to a pre-programmed schedule. Local or remote access for human intervention is achieved through touchpanel, computer, and telephone interfaces.

Crestron products meet ASHRAE standards, and Crestron lighting, HVAC, and shade control (part of the CRESTRON GREEN LIGHT™ family of products) contribute to LEED certification and CEC Title 24 compliance. Additionally, all Crestron products conform to the European Union (EU) Directive 202/95/EC Restriction of Hazardous Substances (RoHS).

A Crestron control system, programmed to maximize the economical use of lights, shades/drapes, ceiling fans, HVAC, and outdoor systems such as sprinklers and weather stations, ensures that all steps are taken to save energy without sacrificing comfort or convenience. By integrating disparate systems on one control platform and employing touchpanels, efficiencies are increased well beyond a basic lighting system with keypad control.

The scheduling functions built into every Crestron control system do it all: occupants don't even have to remember to press a button. By programming the system according to lifestyle, and automatically managing corresponding sub-systems based on time of day and/or occupancy sensors, Crestron makes life greener.

ASHRAE (American Society of Heating, Refrigeration, and Air-Conditioning Engineers) focuses on sustainable building research, standards writing, publishing and continuing education.

LEED (Leadership in Energy and Environmental Design) is the nationally accepted benchmark for the design, construction and operation of high performance green buildings.

RoHS restricts the use of the hazardous substances Lead, Mercury, Cadmium, Hexavalent Chromium, PBB and PDBE in electrical and electronic equipment.

CEC Title 24 represents the periodically updated standards established in 1978 to reduce California's energy consumption.

Intelligent Energy Management in Residential Spaces

Modern homes are built with combinations of complex systems, including security, distributed audio/video, HVAC, lighting, motorized window treatments and more. Crestron connects all these systems on a single, flexible control backbone, simplifying the user experience and intelligently conserving energy in the process.

In an integrated system, arming the security system upon leaving the house, for example, can simultaneously switch off light fixtures and AV equipment while adjusting thermostats. Where factors are reasonably predictable, Crestron systems can be programmed to automate functions, such as thermostat setback and lighting scenes. The scalability of Crestron systems allow comprehensive energy savings to be realized in applications ranging from a single home to multiple dwelling units (MDUs).

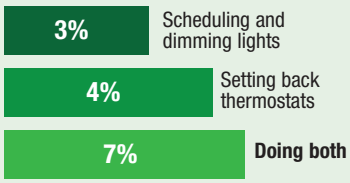
iLux™, a CRESTRON GREEN LIGHT™ product, is designed to operate as a stand-alone lighting and shade control system or as part of a complete automation solution. It provides the immediate benefits of dimming along with an integral occupancy sensor. Lights turn off after an adjustable time delay once the room is unoccupied, providing significant energy savings and lamp life extension. Since iLux is part of an integrated control solution, the system can also communicate an unoccupied status to the HVAC system, to put the space into an energy saving setback mode.

Shades can be tied into the system and programmed according to season, time or actual ambient light levels. Blocking direct sunlight minimizes glare and reduces air conditioning costs, while using direct sunlight enhances heating system efficiency. Interfaces to shade motors provide true feedback to touchpanels, indicating shade position in a bar graph or percentage gauge. Shades can be manually controlled via a graphical slider on the touchpanel or programmed to adjust to the sun's position.

Crestron thermostats connect directly into standard residential HVAC systems using industry standard wiring, and back to a Crestron control system processor for integrated control. The control system automatically adjusts temperature settings, enabling energy savings when residents are away or asleep.

Additionally, Crestron provides IP-based access, delivering solutions that achieve touchpanel functionality from any connected PC. This gives end users the ability to monitor and control the system remotely via a consistent control system interface.

Potential for saving energy:



(Based on 4,000 sq. ft house where lighting accounts for 10% of total energy usage, heating and cooling 31%)

Heating and cooling systems in the U.S. emit 150 million tons of carbon dioxide into the atmosphere each year, and also generate about 12% of the nation's sulfur dioxide and 4% of its nitrogen oxides, the chief ingredients in acid rain.

Ceiling fans make people feel cooler, allowing thermostats to be set three or four degrees higher and saving about 25 percent on cooling costs. Use only in occupied spaces, though, because fans cool people, not rooms.

Intelligent Energy Management in Commercial Spaces

Crestron enables building managers to monitor, control and manage energy consumption on a facility-wide basis with an array of intelligent devices and powerful software tools. Combined with the ability to integrate sensors and automate functions, Crestron maximizes opportunities to save energy in commercial buildings without diminishing occupant comfort or productivity.

With the scheduling capability built into every Crestron control system, it is easy to take advantage of energy saving opportunities such as load shedding, sweeping unneeded lights off after business hours, adjusting HVAC settings during unused periods and reducing exterior security lighting.

To manage resources enterprise-wide, RoomView®, a multi-user software program, offers global room scheduling, monitoring, controlling, and reporting of AV resources and environmental systems. Facility managers, media directors and IT specialists utilize RoomView to manage AV resources, perform remote system diagnostics, track the usage of projector lamps, log network activity, and automate tasks through event scheduling.

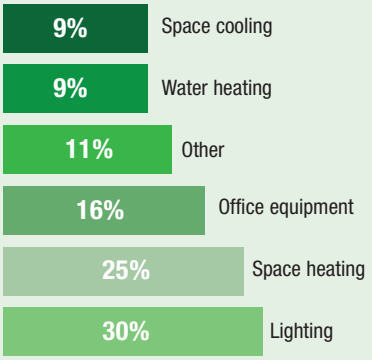
RoomView remotely locks out selected rooms to prevent unauthorized use of TVs, CD players, and other AV equipment. It can track any Crestron-based function, including lighting, audio levels, occupancy status, temperature and more. Tied into Crestron QuickMedia™ transport technology, with video (sync) detection, RoomView can trigger devices such as projectors to automatically shut off shortly after the video signal is disconnected, saving power and lamp life.

The Crestron iLux™ system is LEED, ASHRAE 90.1, and CEC Title 24 compliant, based on an integral motion sensor and the ability to process and respond to feedback from occupancy sensors. iLux is also compliant with ASHRAE 90.1/LEED in terms of the control of display, accent, task and demonstration lighting.

In addition to controlling artificial light, the Crestron system can harness natural light to save energy by dimming or switching off lights within selected rooms when and where natural light is available. The integration of photo sensors maintains required light levels and dims superfluous lighting loads. Daylight harvesting saves significant energy during peak energy demand times, and the corresponding load shedding reduces energy consumption, resulting in substantial cost savings as well as potential rebates from local utilities.

When employees leave for the day, the system continues to monitor and control the environment. Landscape and other non-essential lighting switches off in the evening. If someone works late, occupancy sensors detect movement and illuminate local areas and pathways to exits, automatically shutting off after a predetermined period of time.

Average energy use in U.S office buildings built after 1986:



Using energy-efficient design and technologies in constructing new office buildings can cut energy costs as much as 50%. These include efficient lighting and daylighting systems.

Crestron RoomView enables room scheduling via Microsoft® Outlook for both sporadic use (conference room) and planned use (classroom) control of in-room systems and devices.

Load shedding: turning off or disconnecting loads to limit peak demand.

A good rule of thumb: set back thermostats when zones in the home will be unoccupied for four or more hours.

Relationship, temperature to operating cost:		
Cooling	**$**	**Heating**
72°		72°
74°	4% less	70°
76°	8% less	68°

A two-degree adjustment to thermostat settings (lower in winter, higher in summer) can lower utility bills by four percent and prevent 500 pounds of carbon dioxide from entering the atmosphere each year.

Residential Case Study

The easier systems are to use, the more efficient and effective they are in reducing energy usage. It is important, therefore, as in all home control projects, to understand the lifestyles of the occupants. Systems must be designed to be functionally intuitive, user friendly, and lifestyle-compatible, to consistently maintain both comfort and energy conservation.

The Thomas family has seven people living in their 4200 square foot house, with ages ranging from 12 to 43. Three are in school, three work full time and one works part time.

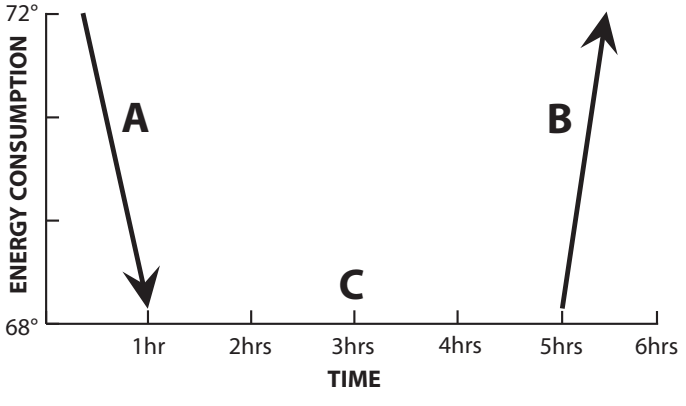
The second floor is made up of six bedrooms. The living room, dining room, kitchen, and family room are on the first, and a home theater, bar, and billiard room occupy the finished basement. Outside are two patios and a deck with hot tub. The Crestron system manages all light fixtures and levels (dimmed to an energy-saving preset of 90 percent), three zones of HVAC, eight zones of distributed audio, and three zones of distributed video.

The Thomas's system automatically sets back the thermostats by four degrees between the hours of 8am and 4pm. Between 11pm and 5am, the bedrooms are set back four degrees, and the first floor and basement are set back six degrees.

To further maximize savings in a home where schedules fluctuate, the Thomas's have their system programmed with three key functions:

1. "AWAY" – when the last person leaves the house each day, this button arms the security system and switches off lights and AV equipment
2. "HOME" – when the first person returns home, this button disarms the security system and recalls a lighting preset according to the time of day
3. "GOODNIGHT" – arms the security system, dims the foyer light to "nightlight" and switches off all other interior lights and AV equipment

It is a misconception that a furnace works harder to warm a space after the thermostat has been set back. The fuel needed to reheat a building to a comfortable temperature (B) is roughly equal to the fuel saved as the building drops to a lower temperature (A). **The longer a home remains at an adjusted temperature, the more energy is saved (C).**



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Commercial Case Study

Crestron began construction on a 90,000 square foot Research Center in November 2006, and the building is now occupied by the company's CEO, engineering departments, and IT services. This facility is where Crestron designs, develops and tests new technologies.

Conference rooms use dimmable fluorescent fixtures with optimal photometric distribution that maximize efficacy. Scheduling and automated control are managed by RoomView® software and sensor technology, so if a room is unoccupied, all lights and AV equipment will turn off.

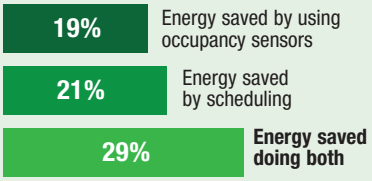
Interior lights are scheduled to go off at 10pm, and lights are circuited so that each department is individually controlled.

In the event that any department is occupied after hours, an illuminated egress path is maintained, and an automatic sweep occurs every 20 minutes to identify lights that are on and cause them to flash four times. Those lights will turn off within ten minutes unless a keypad button in the applicable department is pressed, resetting the sweep timer.

In the 30,000 square foot lab, non-essential areas remain off until switched on manually. Sensors monitor activity and turn lights off when no motion is detected.

Exterior lights are controlled from an astronomical time clock that turns the lights on 15 minutes before sunset. At 10:00pm, all exterior lights are switched off except for those in the parking lots, which remain on for safety and security until sunrise. A high efficiency gas furnace with a hot water piping system is controlled on an energy-saving setback schedule.

Facility-wide lighting control:



Savings shown are an estimated percentage of lighting energy saved compared to a manually controlled system

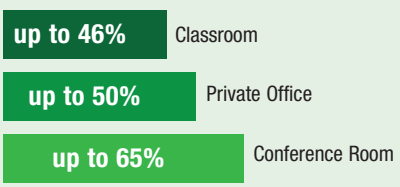
CRESTRON GREEN LIGHT™ control systems have a built-in astronomical clock in order to trigger actions based on time of day or sunrise/sunset.

Using Crestron dimmers to reduce light levels by 10 percent – barely perceptible to the human eye – saves 10 percent of energy and doubles bulb life.

Potential Savings over Five Years		
Dim lights by	Reduce CO_2 emissions by	Preserve coal by
10%	408 lbs.	174 lbs.
25%	1,019 lbs.	435 lbs.
50%	2,039 lbs.	869 lbs.

Most electricity in the U.S is generated by coal-fired power plants: burning coal is among the worst causes of greenhouse gas emissions.

Typical range of savings using occupancy sensors:



Conclusion

Crestron uniquely delivers fully integrated control solutions that manage disparate sub-systems, such as lighting, shades, and HVAC on a common platform. This achieves a synergy that greatly enhances functionality, ease of use, and energy savings.

Intelligent efficiency, made possible by integrated control, is the ability to monitor environmental conditions and automatically adjust to them, maximizing opportunities to conserve.

Crestron solutions control, monitor and manage all environmental systems locally on touchpanels and globally from PCs, delivering both energy savings and a virtually seamless user experience that make life greener.

For more information:
Please email greenpaper@crestron.com.

About Crestron:
The Crestron name has been synonymous with control systems since its inception 40 years ago. Crestron continues to develop innovative solutions, capitalizing on the best evolving technologies and exceeding market expectations.

Sources:

U.S. Department of Energy
U.S. Energy Information Administration
New Building Institute
ENERGY STAR
Progress Energy
Lighting Controls Association
Lighting Research Center
Platts

Memberships:

U.S. GREEN BUILDING COUNCIL MEMBER

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