



U.S. Department of Energy
Energy Efficiency and Renewable Energy



Saving Energy And Money Through Lighting Controls

*Prepared for Rebuild America
By Novitas, Inc.*

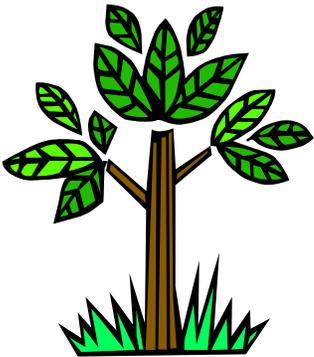
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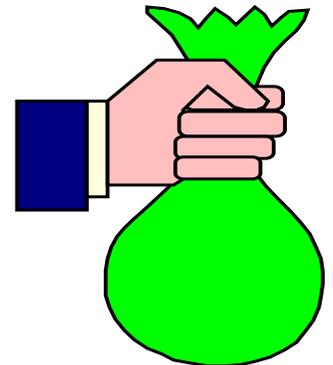


Why Use Lighting Controls?

Practicing environmental responsibility in designs

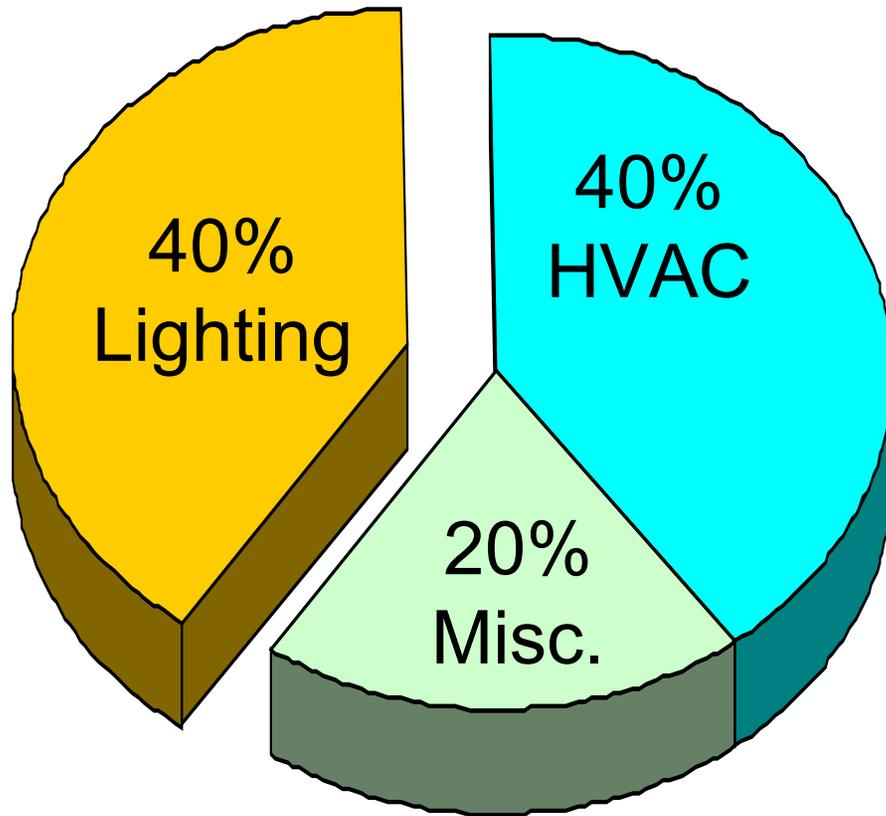


- Lowers Pollutants in Atmosphere
- Lowers Operational Costs of Facility
- Generates Funds for Productive Use
- Increases Asset Value
- Enhances Occupant Convenience



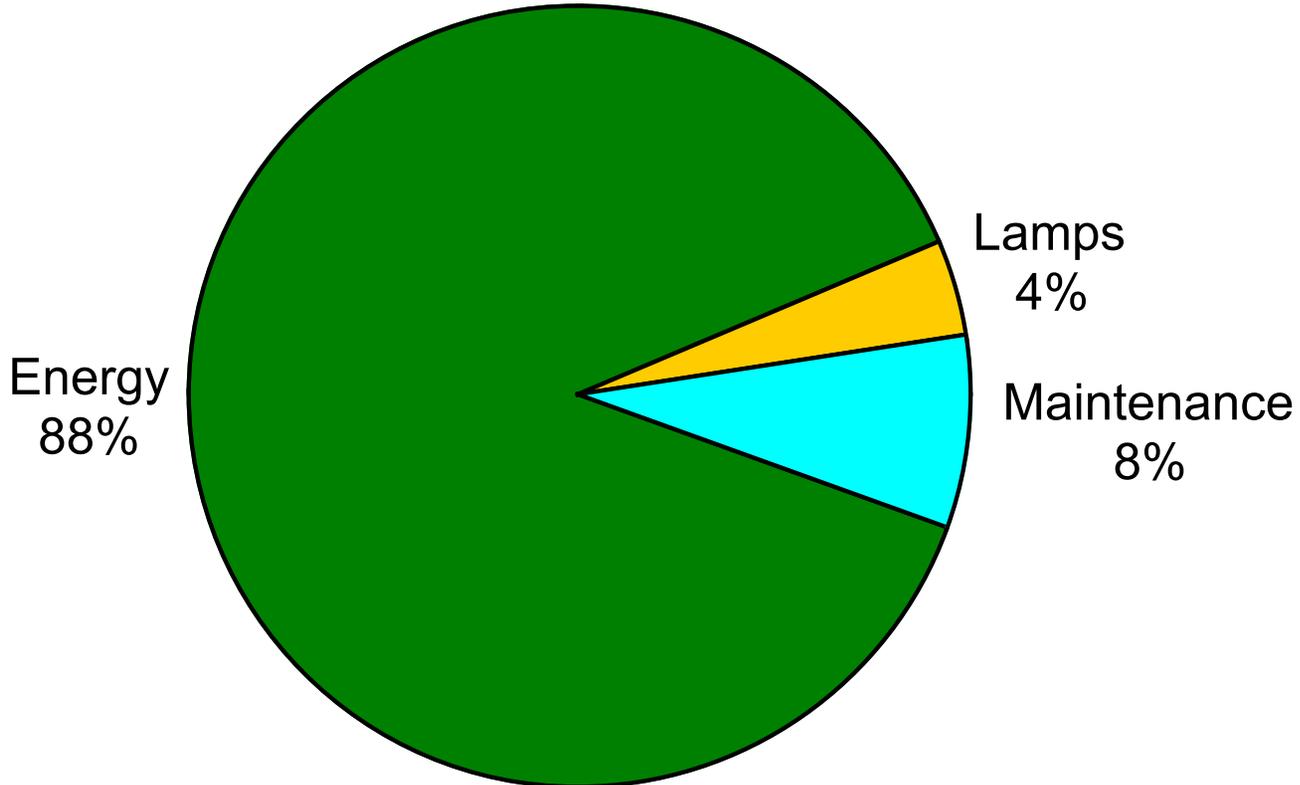


Typical Building Electrical Costs





What is the True Cost of Lighting?





Lighting Control Opportunities

- Office Space
- Education Buildings
- Hospitals/Health Care
- Warehouses
- Parking Structures



Lighting Control Cuts Costs

About half of your lighting bill goes to wasted lighting.

Daily Lighting Period	Hours of Lighting	Hours Wasted
8am – 12 noon	4	1
12 noon – 2pm	2	1
2pm – 6pm	4	1
6 pm – Midnight	3*	2.8
Daily Hours	13	5.8
Percent of Total Daily Hours	100%	45%

*Assumes cleaning crew turns out lights as they complete each floor

Lighting control can also reduce the need for cooling, leading to reduced HVAC costs.



Energy Savings=Increased Asset Value

	<u>Per Sq. Ft.</u>
• Automatic Lighting Controls Cost	\$0.35
• Annual Savings	\$0.18
• Payback	2.0 years
• Annual ROI	56%
• Net Operating Income Increase	\$0.18
• Asset Value Increase (10% Capitalization Rate)	\$1.80
• Increase Per 100,000 Square Feet	\$180,000.00



3 Main Types of Automatic Controls

- Daylighting Devices
- Panel/Computer Controls
- Occupancy Sensors



The Two Critical Considerations

- Occupant Acceptance and Productivity
- Return on Investment
 - Savings
 - Installed Cost
 - Product Life



Savings of Various Options

- Daylighting 16 – 30%
- Panel Controls 18 – 30%
- Occupancy Sensors 30 – 80%



Daylighting



- Lighting controls which turn lights on and off or adjust them up or down based on sunlight *automatically*
- Benefits:
 - Reduced Energy Consumption
 - Codes and Standards Compliance
 - LEED Program
(Leadership in Energy & Environmental Design)



Daylighting: Common Applications

Classrooms/Cafeterias



Atriums



Perimeter Offices



Scheduling: Saving Energy with Panel Controls



- Automatically turn on, turn off or dim lights throughout a building.
- Should include:
 - Warning method with occupant overrides
 - OR
 - Connection to occupancy sensors



Control Panel Applications:

Applications

- Open Office Space
- Lobbies/Auditoriums
- Security and parking lots



Benefits

- Adapts to Predictable Occupancy
- Facilitates Use of Load Shedding Programs
- Predictable Savings





Occupancy Sensors (Automatic Switches)

- **Detect Presence or Absence of People**
- **Turn lights On and Off**
- **Replaces the Old Wall-Mounted, Manual Snap Switch**
- **Ceiling Units Combine With Snap Switch or Dimmers**





Sensor Considerations

- Performance More Important Than Technology
- Ability to Detect Minor Motion Is Critical
- Ease of Installation
- Consider Sensors with Automatic Settings



Occupancy Sensors

Technologies:

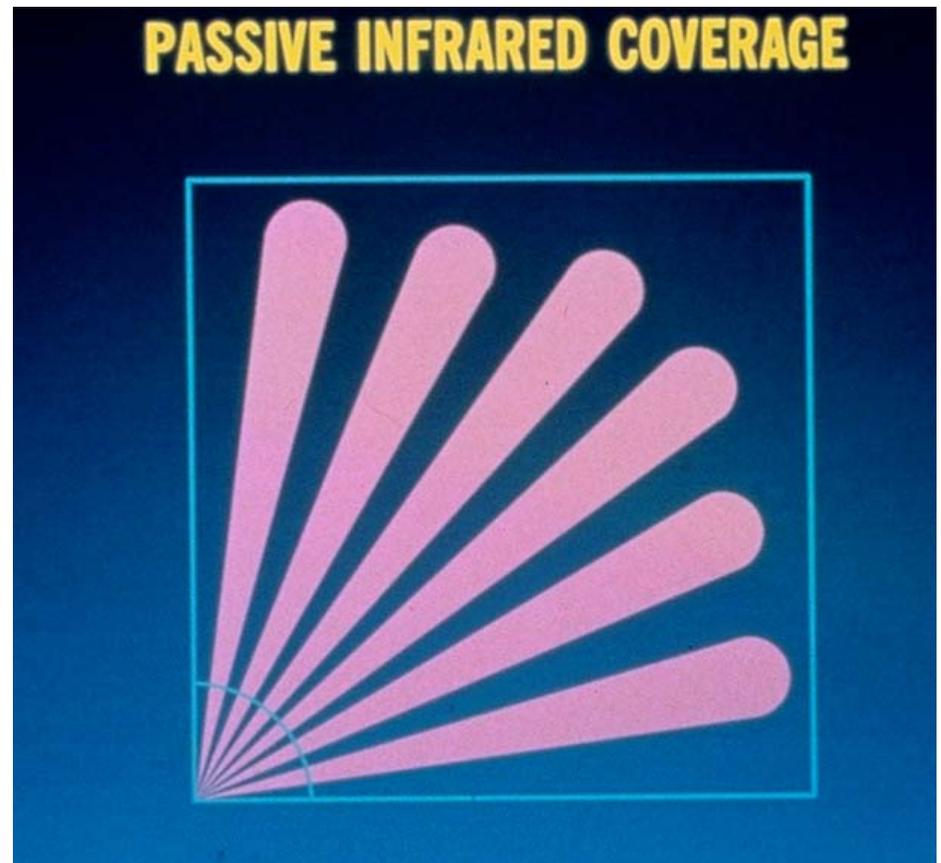
- Passive Infrared
- Ultrasonic
- Dual Technology





Passive Infrared Occupancy Sensors

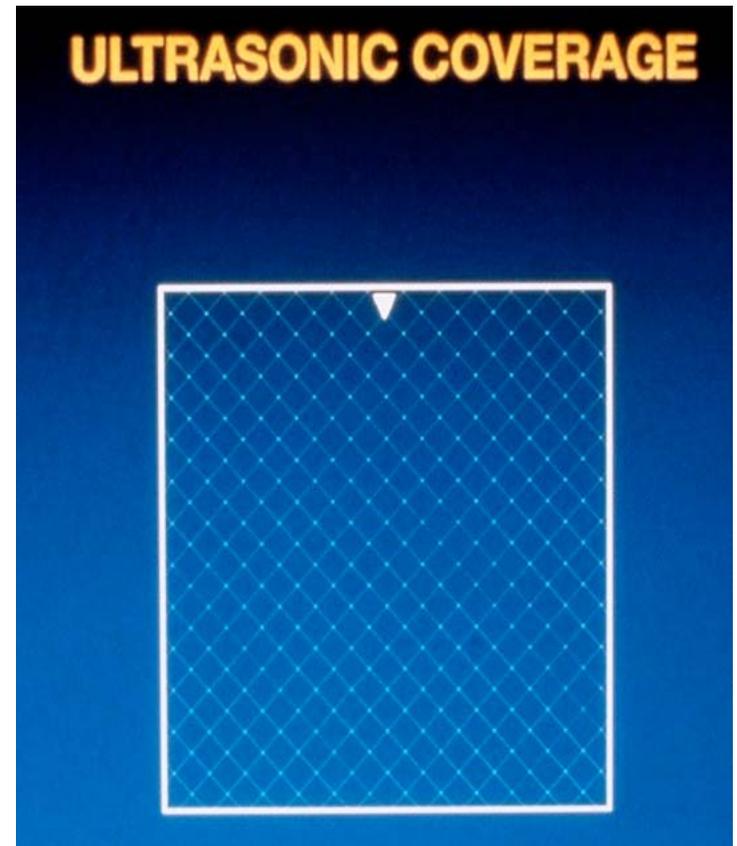
- Triggered by the movement of a heat-emitting body through the field of view.
- Best suited for small, enclosed spaces.





Ultrasonic Occupancy Sensors

- Emit an inaudible sound wave.
- Triggered by changes in the reflected sound.
- Provides coverage without gaps.





Dual-Technology Occupancy Sensors

- Combine passive infrared and ultrasonic technologies.
- The pairing of these two technologies helps eliminate false activations, increasing energy savings.



Monitored Savings of Occupancy Sensors

Private Offices	45%
Conference Rooms	50%
Classrooms	51%
Restrooms	68%

(Savings Do Not Include HVAC Reduction)

Source: Lighting Research Center, Study For EPA in 158 Locations



Demand Reduction Study in 105 Individual Offices

- No Controls 45 KW
- Occupancy Sensor Control 31 KW
- Demand Reduction 31%

Source: TRW, 1988



Occupancy Sensors

ANNUAL SAVINGS

	Classroom	Restroom	Small Office
Typical Room Size	38' X 37'	15' X 20'	15' X 10'
Lighting Loads (Watts)*	2,100	392	232
Annual Lighting Hours	2,800	5,600	3,500
Annual KWH	5,880	2,195	812
Annual Cost @ \$.08 KWH	\$470	\$175	\$65
Percent Savings	40%	60%	45%
Annual Savings	\$188	\$105	\$29
Savings Per Square Foot	\$0.13	\$0.35	\$0.19

*Assumes Electronic Ballasts and T-8 Lamps have been installed.



Occupancy Sensors

PAYBACK AND RETURN ON INVESTMENT

	Classroom	Restroom	Small Office
Installed Cost	\$275	\$150	\$55
Annual Savings	\$188	\$105	\$29
Cost Per Square Foot	\$0.20	\$0.50	\$0.37
Savings Per Square Foot	\$0.13	\$0.35	\$0.19
Payback	1.5 years	1.4 years	1.9 years
5 Year Net Savings	\$665.00	\$375.00	\$91.00
Return on Investment	73.0%	74.7%	57.2%



You May Delay But Time Will Not

-Benjamin Franklin

Act Now!