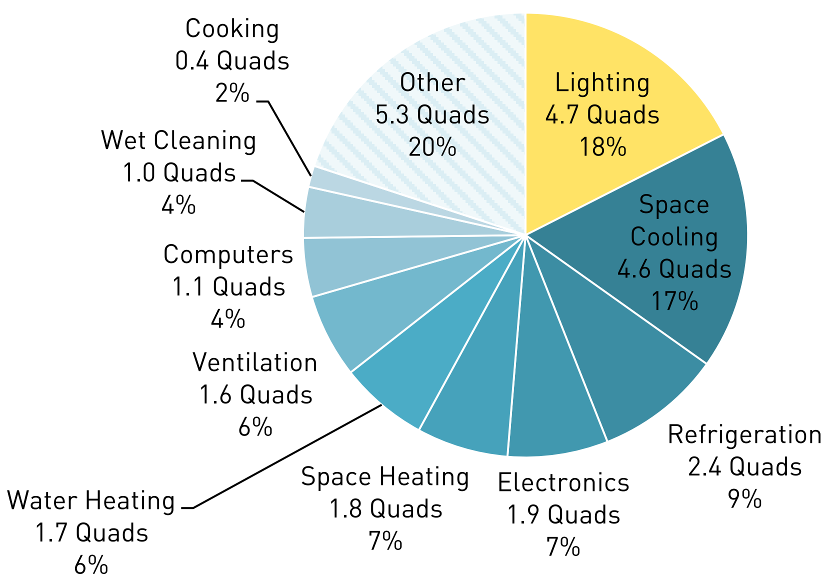
Energy Savings from Legrand Products

Executive Summary

We spend almost 90% of our time in buildings,[1] and buildings require energy for everything from lighting, to heating and cooling, to appliances. In 2015, residential and commercial buildings consumed 40% of the nation's energy, at a scale of approximately 39 quadrillion Btu.[2] The resulting carbon emissions from U.S. residential and commercial buildings are approximately 2.1 billion metric tons of carbon dioxide emissions each year.[3] For individuals looking to save energy and reduce their carbon footprints, the installation of energy saving technologies in buildings has the potential to make a significant impact.

Lighting is the largest defined category of primary electricity use in the buildings sector and overall, represents 18% of the electricity used to power the nation's residential and commercial buildings, as shown in Figure 1.[4]

Figure 1.Energy consumed by lighting as a percentage of the total primary electricity consumed in residential and commercial buildings (1 Quad = 1 Quadrillion Btu).[4]



Controls include a variety of technologies, such as dimmers, occupancy sensors, and daylight sensors that can be used to create a more comfortable working and living environment, while minimizing the energy requirement. By adjusting the operating pattern of lighting systems, lighting controls can achieve deeper savings than high efficiency lighting alone. For example, Lawrence Berkeley National Laboratory estimates that nearly 20% of the energy used for lighting can be saved if lighting controls were fully implemented throughout the U.S. commercial buildings sector.[5]

This technical paper examines typical use scenarios for Legrand energy saving products and estimates the energy, cost (including return-on investment), and carbon savings resulting from the application of these Legrand products. An overview of these scenarios and some common input assumptions used for each are described in Figure 2.

These savings estimates can be used as benchmarks to better understand the impact these products can have on building performance. All energy savings calculations are based on the best available national research and studies, but actual savings achieved will vary by specific application. In cases where data is unavailable or incomplete, assumptions are made using industry expertise and best practices. All data sources and assumptions are clearly stated throughout this technical paper or listed in the endnotes with the goal of upholding the highest standard for transparency and thorough analysis.

Figure 2. Lighting controls use cases and basic assumptions used in this technical paper.[6, 7, 8, 9]

Commercial Office Buildings

Assumptions	Lighting Controls Use Cases
• 10,000 square foot office building • Office is active an 11.2 hours/day [5], 250 days/year [6] • Average cost of electricity: 10.6 cents/kWh [7]	• Installing dimmer controls • Installing occupancy sensors • Installing timer controls • Installing daylight sensors for dimming • Installing receptacle plugload controls

Parking Structures

Assumptions	Lighting Controls Use Cases
• 42,000 square foot, three-story, parking structure • Parking structure is active 11.2 hours/day [5], 250 days/year [6] • Average cost of electricity: 10.6 cents/kWh [7]	• Installing daylight sensors for dimming • Installing motion sensors to trigger lighting based on vehicle movement

Warehouses

Assumptions	Lighting Controls Use Cases
• 75,000 square foot warehouse • Warehouse is active an average of 11.2 hours/day [5], 250 days/year [6] • Average cost of electricity: 10.6 cents/kWh [7]	• Installing occupancy sensors for high bay lighting

Residential Houses

Assumptions	Lighting Controls Use Cases
• 2,000 square foot house • Residential lighting activity varies based on room type. An average of 1.45 hours/day was used in most cases [8] • Average cost of electricity 12.7 cents/kWh [7]	• Installing dimmer controls • Installing occupancy sensor • Installing timer controls • Installing daylight sensors for dimming

Technical expertise and a review of the assumptions applied in each use case was provided by Energetics Incorporated (www.energetics.com). Energetics is an energy and environmental consulting firm that specializes in energy analysis and the evaluation of energy efficiency and renewable energy technologies.

Installation of Dimmers in a Commercial Office Building

Description of Use Case

Installing dimmers in a commercial building can reduce energy consumption by allowing users to select their optimal level of lighting. Dimmed lights consume less electricity, which can add up to significant savings over the course of a year. This analysis estimates savings resulting from the installation of dimmers in conference rooms and offices in a 10,000 square foot commercial office building that uses primarily LED lighting.

Methodology to Calculate Savings

To estimate the energy costs to light the affected areas, this analysis combines a typical lumen output of LED light fixtures with the level of illumination expected for an office space, and scales this quantity over the affected square footage. Energy cost calculations are based on square footage and typical illumination levels in order to estimate average lighting requirements regardless of the specific layout of the building. An average luminous efficacy value of 100 lumens per watt is used for LED lighting[10], along with an illumination estimate for office spaces of 35 lumens per square foot.[11] An energy savings rate of 38% is applied to the affected areas based on a study on typical energy savings from dimming controls that allow for personal tuning by Lawrence Berkeley National Laboratory.[12, 13]

This measure is estimated to reduce annual energy consumption by 3,724 kWh, equal to $394 saved annually, and a 2.6 metric ton annual reduction in CO_2 emissions.[14] With an estimated cost of $1,000 (20 dimmers at $50 per dimmer),[15] this measure has a simple payback period of 2.5 years.

Installation of Dimmers in a Commercial Office Building

Specifications:

- 10,000 square foot building
- LED lighting
- Dimmers applied to conference spaces, offices, and break rooms.
- $0.1059 per kWh electricity costs[8]

Annual Savings:

- 3,724 kWh
- $394 in electricity costs
- 2.6 metric tons of CO_2

Return on Investment:

- Simple payback of 2.5 years
- 1-year simple ROI of 66%

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Installation of Occupancy Sensors in a Commercial Office Building

Description of Use Case

Installing occupancy sensors in a commercial building can reduce energy consumption by turning lights on and off automatically based on the presence of occupants. This can result in significant savings as occupancy sensors eliminate wasted light energy in unused spaces. This analysis estimates savings resulting from the installation of occupancy sensors in open office spaces in a 10,000 square foot commercial office building that uses primarily fluorescent tube lighting.

Methodology to Calculate Savings

To estimate the energy costs to light the affected areas, this analysis combines a typical lumen output of fluorescent tube light fixtures with the level of illumination expected for an office space, and scales this quantity over the affected square footage. Energy cost calculations are based on square footage and typical illumination levels in order to estimate average lighting requirements regardless of the specific layout of the building. A luminous efficacy value of 75 lumens per watt was used for fluorescent tube lighting,[10] with an illumination estimate for office spaces of 35 lumens per square foot.[11] An energy savings estimate of 35% was applied to the affected areas based on a study on typical energy savings from occupancy sensors in open office spaces by the Lighting Controls Association.[13, 16]

This measure is estimated to reduce annual energy consumption by 4,573 kWh, equal to $484 saved annually, and a 3.2 metric ton annual reduction in CO_2 emissions.[14] With an estimated cost of $1,000 (twenty sensors at $50 per sensor),[15] this measure has a simple payback period of 2.1 years.

Installation of Occupancy Sensors in a Commercial Office Building

Specifications:

- 10,000 square foot building
- Fluorescent tube lighting
- Occupancy sensors applied to open office spaces.
- $0.1059 per kWh electricity costs[8]

Annual Savings:

- 4,573 kWh
- $484 in electricity costs
- 3.2 metric tons of CO_2

Return on Investment:

- Simple payback of 2.1 years
- 1-year simple ROI of 48%

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Installation of Timer Controls in a Commercial Office Building

Description of Use Case

Installing timer controls in a commercial building can reduce energy consumption by letting users set default off-times for lights. This can result in savings by reducing the chance of lights being left on for excessive periods of time after occupants have left. This analysis estimates savings resulting from the installation of timer controls in the bathrooms of a 10,000 square foot commercial office building that uses primarily fluorescent tube lighting. The total size of the affected bathrooms is estimated to be 1,500 square feet.

Methodology to Calculate Savings

To estimate the energy costs to light the affected areas, this analysis combines a typical lumen output of fluorescent tube light fixtures with the level of illumination expected for an office space, and scales this quantity over the affected square footage. Energy cost calculations are based on square footage and typical illumination levels in order to estimate average lighting requirements regardless of the specific layout of the building. A luminous efficacy value of 75 lumens per watt is used for fluorescent tube lighting,[10] with an illumination estimate for bathrooms of 75 lumens per square foot.[11] The energy savings estimate used 11.2 hours as the average daily on-time of lights before the retrofit,[6] and assumed that light-on time could be limited by timer controls to 8 hours per day, resulting in savings of 29%.

This measure is estimated to reduce annual energy consumption by 1,200 kWh, equal to $127 saved annually, and a 0.8 metric ton annual reduction in CO_2 emissions.[14] With an estimated cost of $120 (three controls at $40 per control),[15] this measure has a simple payback period of 0.9 years.

Installation of Timer Controls in a Commercial Office Building

Specifications:

- Applied to 1,500 square feet of bathrooms in a 10,000 square foot building
- Fluorescent tube lighting
- $0.1059 per kWh electricity costs[8]

Annual Savings:

- 1,200 kWh
- $127 in electricity costs
- 0.8 metric tons of CO_2

Return on Investment:

- Simple payback of 0.9 years
- 1-year simple ROI of 106%

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Installation of Daylight Sensors in a Commercial Office Building

Description of Use Case

Installing daylight sensors in a commercial building can reduce energy consumption and provide balanced lighting levels by automatically adjusting lighting levels to take advantage of natural light and reduce lighting illumination provided by fixtures. This reduces over-lighting of spaces, saving energy that would otherwise be used by excess lighting. This analysis estimates savings resulting from the installation of daylight sensors in a 10,000 square foot commercial office building that uses primarily fluorescent tube lighting.

Methodology to Calculate Savings

To estimate the energy costs to light the affected areas, this analysis combines a typical lumen output of fluorescent tube light fixtures with the level of illumination expected for an office space, and scales this quantity over the square footage. Energy cost calculations are based on square footage and typical illumination levels in order to estimate average lighting requirements regardless of the specific layout of the building. A luminous efficacy value of 75 lumens per watt is used for fluorescent tube lighting,[10] with an illumination estimate for office spaces of 35 lumens per square foot.[11] An energy savings estimate of 38% is applied to the affected areas based on a study on typical energy savings from the application of daylight sensors in office spaces by the Lawrence Berkeley National Laboratory.[12, 13]

This measure is estimated to reduce annual energy consumption by 4,965 kWh, equal to $525 saved annually, and a 3.5 metric ton annual reduction in CO_2 emissions.[14] With an estimated cost of $600 (eight sensors at $75 per sensor),[15] this measure has a simple payback period of 1.1 years.

Installation of Daylight Sensors in a Commercial Office Building

Specifications:

- 10,000 square foot building
- Fluorescent tube lighting
- Daylight sensors applied to areas with access to natural light.
- $0.1059 per kWh electricity costs[8]

Annual Savings:

- 4,965 kWh
- $525 in electricity costs
- 3.5 metric tons of CO_2

Return on Investment:

- Simple payback of 1.1 years
- 1-year simple ROI of 88%

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Installation of Plug Load Controls in a Commercial Office Building

Description of Use Case

Installing plug load controls in a commercial building can reduce energy consumption by reducing power use by electrical equipment during non-business hours. Equipment such as computer monitors, desk lamps, and printers may normally be left on during non-business hours. Plug load controls can provide savings by shutting off power to these appliances during hours when the space would not be in use. This analysis estimates savings resulting from the installation of plug load controls in a 10,000 square foot commercial office building with 65 employees.[17]

Methodology to Calculate Savings

This analysis estimates energy savings by scaling the average energy saved per employee by plug load controls to the total number of employees in the building. Using 11.2 hours as the average daily operating hours for a commercial space,[6] it is assumed that the building has 12.8 hours of inactivity per day. A report by the American Council for an Energy-Efficient Economy (ACEEE) estimates that 39 watts per employee could be saved during non-business hours in a small (less than 100,000 square foot) office building.[18] By applying this to the number of employees and number of non-business hours per day, we estimate that this would result in 8,123 kWh of savings annually.

This measure is estimated to save $860 on electricity costs annually, and provide a 5.7 metric ton annual reduction in CO_2 emissions.[14] With an estimated cost of $3,250 (65 controls at $50 per control),[15] this measure has a simple payback period of 3.8 years.

Installation of Plug Load Controls in a Commercial Office Building

Specifications:

- 10,000 square foot building
- 80 employees
- Plug load controls applied to electrical appliances such as computer monitors, desk lamps, and printers.
- $0.1059 per kWh electricity costs[8]

Annual Savings:

- 8,123 kWh
- $860 in electricity costs
- 5.7 metric tons of CO_2

Return on Investment:

- Simple payback of 3.8 years
- 1-year simple ROI of 26%

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Installation of Daylight Sensors for Dimming in a Parking Structure

Description of Use Case

Parking structures can use dimmers in combination with daylight sensors to take advantage of natural light entering the structure. Based on the level of light detected, dimming controls can reduce light levels of fixtures, reducing the energy used to power lights. This reduces over-lighting of spaces, saving energy that would otherwise be used by excess lighting. This analysis estimates savings resulting from the installation of daylight sensors for dimming in a 42,000 square foot, three-story parking structure that uses primarily LED lighting.

Methodology to Calculate Savings

To estimate the energy costs to light the affected areas, this analysis combines a typical lumen output of LED light fixtures with the level of illumination expected for a parking structure, and scales this quantity over the square footage. Energy cost calculations are based on square footage and typical illumination levels in order to estimate average lighting requirements regardless of the specific layout of the building. A luminous efficacy value of 100 lumens per watt was used for LED lighting,[10] with an illumination estimate for parking structures of 10 lumens per square foot.[11] To estimate the annual hours that lights would be dimmed, this analysis uses data from the National Oceanic and Atmospheric Administration (NOAA).[19] Using Hartford, Connecticut as the location, the parking structure is assumed to have 2,585 annual sunshine hours. Under this assumption, dimming controls could set lights to a 70% power level during these hours which would result in an energy savings reduction estimate of 28%.

This measure is estimated to reduce annual energy consumption by 3,257 kWh, equal to $345 saved annually, and a 2.3 metric ton annual reduction in CO_2 emissions.[14] With an estimated cost of $900 (twelve sensors at $75 per sensor),[15] this measure has a simple payback period of 2.6 years.

Installation of Daylight Sensors for Dimming in a Parking Structure

Specifications:

- 42,000 square foot parking structure
- LED lighting
- $0.1059 per kWh electricity costs[8]

Annual Savings:

- 3,257 kWh
- $345 in electricity costs
- 2.3 metric tons of CO_2

Return on Investment:

- Simple payback of 2.6 years
- 1-year simple ROI of 38%

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Installation of Occupancy Sensors in a Parking Structure

Description of Use Case

Installing occupancy sensors in a parking structure can reduce energy consumption by adjusting light levels based on the presence of vehicle or pedestrian movement. This can result in significant savings as occupancy sensors can reduce energy wasted by lights in unoccupied areas. This analysis estimates savings resulting from the installation of occupancy sensors in a 42,000 square foot, three-story parking structure that uses primarily LED lighting.

Methodology to Calculate Savings

To estimate the energy costs to light the affected areas, this analysis combines a typical lumen output of LED light fixtures with the level of illumination expected for a parking structure, and scales this quantity over the square footage. Energy cost calculations are based on square footage and typical illumination levels in order to estimate average lighting requirements regardless of the specific layout of the building. A luminous efficacy value of 100 lumens per watt is used for LED lighting,[10] with an illumination estimate for parking structures of 10 lumens per square foot.[11] An energy savings estimate of 19% was applied to the affected areas based on a study on typical energy savings from occupancy sensors in parking structures by the U.S. Department of Energy.[13, 20]

This measure is estimated to reduce annual energy consumption by 4,788 kWh, equal to $507 saved annually, and a 3.4 metric ton annual reduction in CO_2 emissions.[14] With an estimated cost of $1,200 (twenty-four sensors at $50 per sensor),[15] this measure has a simple payback period of 2.4 years.

Installation of Occupancy Sensors in a Parking Structure

Specifications:
- 42,000 square foot parking garage
- LED lighting
- $0.1059 per kWh electricity costs[8]

Annual Savings:
- 4,788 kWh
- $507 in electricity costs
- 3.4 metric tons of CO_2

Return on Investment:
- Simple payback of 2.4 years
- 1-year simple ROI of 42%

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Installation of High Bay Occupancy Sensors in a Warehouse

Description of Use Case

Installing occupancy sensors in a warehouse can reduce energy consumption by reducing light levels in low-traffic areas when occupants are not present. This can result in significant savings as occupancy sensors can reduce energy wasted by lights in unoccupied areas, which is especially important in warehouses. This analysis estimates savings resulting from the installation of occupancy sensors in a 75,000 square foot warehouse that uses primarily metal halide lighting.

Methodology to Calculate Savings

To estimate the energy costs to light the affected areas, this analysis combines a typical lumen output of metal halide light fixtures with the level of illumination expected for a warehouse, and scales this quantity over the square footage. Energy cost calculations are based on square footage and typical illumination levels in order to estimate average lighting requirements regardless of the specific layout of the building. A luminous efficacy value of 75 lumens per watt is used for metal halide lighting,[10] with an illumination estimate for warehouses of 20 lumens per square foot.[11] An energy savings estimate of 35% is then applied to the affected areas based on a study on typical energy savings from wireless occupancy sensors in warehouses by the U.S. Department of Energy. [13, 21]

This measure is estimated to reduce annual energy consumption by 22,750 kWh, equal to $1,567 saved annually, and a 16.0 metric ton annual reduction in CO_2 emissions.[14] With an estimated cost of $3,000 (thirty sensors at $100 per sensor),[15] this measure has a simple payback period of 1.9 years.

Installation of High Bay Occupancy Sensors in a Warehouse

Specifications:

- 75,000 square foot warehouse with high-bay lighting
- Metal halide lighting
- Occupancy sensors applied to high bay fixtures.
- $0.0689 per kWh electricity costs[8]

Annual Savings:

- 22,750 kWh
- $1,567 in electricity costs
- 16.0 metric tons of CO_2

Return on Investment:

- Simple payback of 1.9 years
- 1-year simple ROI of 52%

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Installation of Dimmers in a Residential Building

Description of Use Case

Installing dimmers in a residential building can reduce energy consumption by allowing users to select their optimal level of lighting. Dimmed lights consume less electricity, which can add up to significant savings over the course of a year. This analysis estimates savings resulting from the installation of dimmers in the living room, bedrooms, and hallways of a 2,000 square foot house that uses primarily LED lighting. The total size of the affected areas is estimated to be 1,500 square feet.

Methodology to Calculate Savings

To estimate the energy costs to light the affected areas, this analysis combines a typical lumen output of LED light fixtures with the level of illumination expected for a house, and scales this quantity over the square footage. Energy cost calculations are based on square footage and typical illumination levels in order to estimate average lighting requirements regardless of the specific layout of the building. A luminous efficacy value of 100 lumens per watt is used for LED lighting,[9] with an illumination estimate for living rooms, bedrooms, and hallways of 15 lumens per square foot.[22] An energy savings estimate of 36% is applied to the affected areas based on a study on typical energy savings from dimmers by the Lighting Controls Association.[23, 13] Based on a U.S. Department of Energy study on residential lighting energy consumption, the typical daily operating hours for these spaces is estimated to be 1.45 hours.[9]

This measure is estimated to reduce annual energy consumption by 43 kWh, saving $5 annually, with a 0.03 metric ton annual reduction in CO_2 emissions.[14, 24]

Installation of Dimmers in a Residential Building

Specifications:
- Applied to 1,500 square feet of living room, bedrooms, and hallways in a 2,000 square foot house
- LED lighting
- $0.1267 per kWh electricity costs[8]

Annual Savings:
- 43 kWh
- $5 in electricity costs
- 0.03 metric tons of CO_2

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Installation of Occupancy Sensors in a Residential Building

Description of Use Case

Installing occupancy sensors in a residential building can reduce energy consumption by turning lights on and off automatically based on the presence of occupants. This can result in significant savings as occupancy sensors eliminate energy wasted by lights in unoccupied spaces. This analysis estimates savings resulting from the installation of dimmers in the living room, bedrooms, and hallways of a 2,000 square foot house that uses primarily CFL lighting. The total size of the affected areas is estimated to be 1,500 square feet.

Methodology to Calculate Savings

To estimate the energy costs to light the affected areas, this analysis combines a typical lumen output of CFL light fixtures with the level of illumination expected for a house, and scales this quantity over the affected square footage. Energy cost calculations are based on square footage and typical illumination levels in order to estimate average lighting requirements regardless of the specific layout of the building. A luminous efficacy value of 55 lumens per watt is used for CFL lighting,[9] with an illumination estimate for living rooms, bedrooms, and hallways of 15 lumens per square foot.[22] An energy savings estimate of 28% is applied to the affected areas based on a study on typical energy savings from occupancy sensors by the Lighting Controls Association.[23, 13] Based on a U.S. Department of Energy study on residential lighting energy consumption, the typical daily operating hours for these spaces is estimated to be 1.45 hours.[9]

This measure is estimated to reduce annual energy consumption by 61 kWh, saving $8 annually, with a 0.04 metric ton annual reduction in CO_2 emissions.[14, 24]

Installation of Occupancy Sensors in a Residential Building

Specifications:

- Applied to 1,500 square feet of living room, bedrooms, and hallways in a 2,000 square foot house
- CFL lighting
- $0.1267 per kWh electricity costs[8]

Annual Savings:

- 61 kWh
- $5 in electricity costs
- 0.04 metric tons of CO_2

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Installation of Timer Controls in a Residential Building

Description of Use Case

Installing timer controls in a residential building can reduce energy consumption by letting users set default off-times for lights. This can result in savings by reducing the chance of lights being left on for excessive periods of time after occupants have left. This analysis estimates savings resulting from the installation of timer controls in the bathrooms, garage, and basement of a 2,000 square foot house that uses primarily CFL lighting. The total size of the affected areas is estimated to be 1,500 square feet.

Methodology to Calculate Savings

To estimate the energy costs to light the affected areas, this analysis combines a typical lumen output of CFL lamps with the level of illumination expected for a residential space, and scales this quantity over the square footage. Energy cost calculations are based on square footage and typical illumination levels in order to estimate average lighting requirements regardless of the specific layout of the building. A luminous efficacy value of 55 lumens per watt is used for fluorescent tube lighting,[10] with an illumination estimate for bathrooms of 75 lumens per square foot.[11] The energy savings estimate uses 1.2 hours as the average daily on-time of lights before the retrofit,[9] and assumes that the period that lights are on could be limited by timer controls to 1 hour per day, resulting in savings of 17%.

This measure is estimated to reduce annual energy consumption by 149 kWh, saving $20 annually, with a 0.1 metric ton annual reduction in CO_2 emissions.[14, 24]

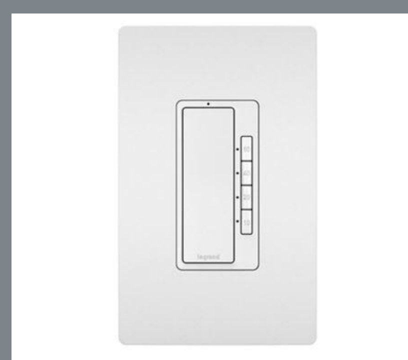
Installation of Timer Controls in a Residential Building

Specifications:

- Applied to 1,500 square feet of the garage, basement, and bathrooms in a 2,000 square foot house
- CFL lighting
- $0.1267 per kWh electricity costs[8]

Annual Savings:

- 149 kWh
- $20 in electricity costs
- 0.1 metric tons of CO_2



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Installation of Daylight Sensors in a Residential Building

Description of Use Case

Installing daylight sensors in a residential building can reduce energy consumption by taking advantage of natural light and reducing the amount of the light provided by fixtures to balance lighting levels. This reduces over-lighting of spaces, saving energy that would otherwise be used by excess lighting. This analysis estimates savings resulting from the installation of dimmers in the living room, bedrooms, and hallways of a 2,000 square foot house that uses primarily CFL lighting. The total size of the affected areas is estimated to be 1,500 square feet.

Methodology to Calculate Savings

To estimate the energy costs to light the affected areas, this analysis combines a typical lumen output of CFL lamps with the level of illumination expected for a residential space, and scales this quantity over the square footage. Energy cost calculations are based on square footage and typical illumination levels in order to estimate average lighting requirements regardless of the specific layout of the building. A luminous efficacy value of 55 lumens per watt is used for fluorescent tube lighting,[10] with an illumination estimate for living rooms, bedrooms, and hallways of 15 lumens per square foot.[11] An energy savings estimate of 43% is applied to the affected areas based on a study on typical energy savings from daylighting controls by the Lighting Controls Association.[23, 13] Based on a U.S. Department of Energy study on residential lighting energy consumption, the typical daily operating hours for these spaces is estimated to be 1.45 hours.[9]

This measure is estimated to reduce annual energy consumption by 62 kWh, saving $8 annually, with a 0.04 metric ton annual reduction in CO_2 emissions.[14, 24]

Installation of Daylight Sensors in a Residential Building

Specifications:

- Applied to 1,500 square feet of the garage, basement, and bathrooms in a 2,000 square foot house
- CFL lighting
- $0.1267 per kWh electricity costs[8]

Annual Savings:

- 62 kWh
- $8 in electricity costs
- 0.04 metric tons of CO_2

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[13] For several of these use cases, this analysis assumes energy savings percentages from published studies and applies these savings estimates to the calculated power requirement of the space in the described use case. Thus, empirical data is used to estimate the magnitude of energy and carbon savings for the specific application described. These results represent typical savings based on relevant studies, but actual savings for specific cases may differ from these estimates due to a wide range of additional factors that can affect energy use in lighting.

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