

sustainable lighting for schools

Litecontrol offers several different Control Solutions (CS) for school lighting systems. Some of our solutions provide daylight harvesting opportunities (CS/dlh and CS/e), some provide opportunities to integrate occupancy sensors into the systems (CS/ir, CS/us, CS/av and CS/e), and some provide flexible switching schemes to accommodate the multi-modal teaching styles popular today (CS/av). All of our Control Solutions provide energy saving opportunities for the school facility.

The question is – how much energy savings? While a seemingly simple question, the answer is far from simple, since it depends entirely on the school’s specific design, location, and usage patterns. However, several independent studies exist that document the savings available with the types of Control Solutions that we offer. These studies are summarized below.

daylight harvesting **LCS**_{dlh}

Lighting Research Center

Rensselaer Polytechnic Institute’s Lighting Research Center published guidelines for daylighting in schools, as part of their Daylight Dividends program. These guidelines recommend indirect lighting for schools:

“Select compatible light fixtures: First consider indirect lighting fixtures that closely represent the effect of daylighting. Since the light is reflected off several surfaces and from various sources, the fixtures will provide high quality light that is more uniform and less glaring.”

This report also summarizes the energy savings from several schools where daylight harvesting systems were installed. The table below shows the schools and the savings reported. (Reference: “Guide for Daylighting Schools,” Lighting Research Center, 2004)

Energy Savings with Daylight Harvesting Systems

School	Location	Savings
Millbrook Elementary School	Raleigh, NC	59%
Heritage Middle School	Wake Forest, NC	43%
Smith Middle School	Chapel Hill, NC	64%
Kenton County Middle School	Kenton, KY	34%
Riverside High School	Greenville, SC	7%

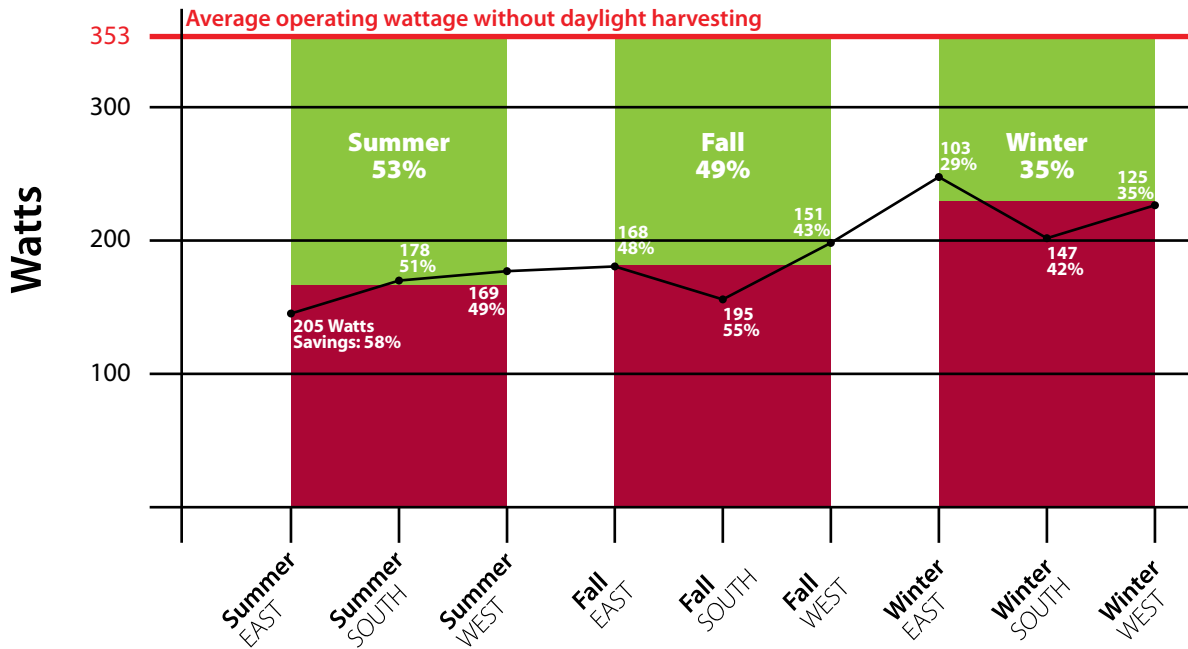
Energy Center of Wisconsin

The Energy Center of Wisconsin studied energy savings from daylight harvesting in a controlled experiment in their research facility. In the experiment, a pair of nearly identical 270 square foot rooms was created on each of the east, south and west sides of the facility. Rooms were operated between 7:00 AM and 6:00 PM. The “base case” room in each pair had four 3-lamp T8 recessed fluorescent fixtures with no daylight control, and the “test room” in each pair had two 12’ rows of 2-lamp pendant indirect-direct T8 fluorescent fixtures with dimming ballasts controlled by a daylight sensor.

The table below shows the energy savings that resulted in these rooms due to daylight harvesting. Overall, the average savings due to daylight harvesting was 46%, with the lowest savings of 29% occurring during the winter in the east rooms, and the greatest savings of 58% occurring in the summer, also in the east rooms. (Reference: “Energy savings from daylighting: A controlled experiment,” Energy Center of Wisconsin, May 2005.)

Mean Operating Wattage by Room and Season

Adapted from “Energy savings from daylighting: A controlled experiment”
Energy Center of Wisconsin, May 2005.



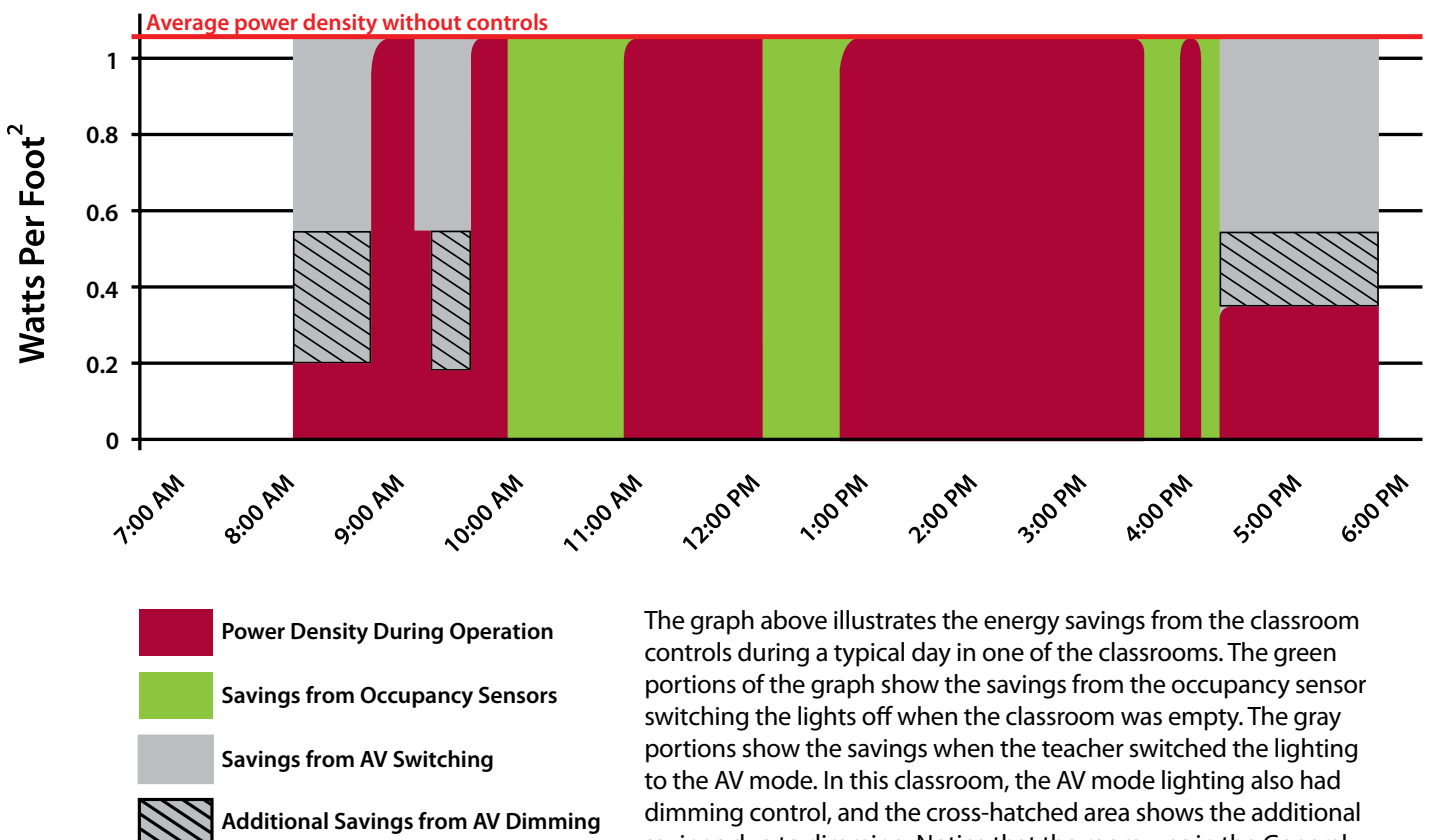
California Energy Commission

As part of the Public Interest Energy Research (PIER) Program, the California Energy Commission studied 19 classrooms in six schools in California: Carlmont High School, Coyote Creek School, Country Club School, Dudley Elementary School, Heritage Elementary School, and Highland Elementary School. This project installed multi-modal switching controls and occupancy sensors in each of the test rooms, and compared the energy use to a “control” room in each school.

Energy savings averaged over 50% for the classroom lighting, ranging from 35% to 75%. Of the total energy savings, roughly 80% was attributed to replacing a recessed fluorescent lighting system with an efficient indirect/direct system, and the remaining 20% of the savings was attributed to the control systems.

Energy Savings Using Controls Throughout the Course of the Day

Adapted from “Project 4.5 Final Report: Public Interest Energy Research Program,” California Energy Commission, October 2005



The graph above illustrates the energy savings from the classroom controls during a typical day in one of the classrooms. The green portions of the graph show the savings from the occupancy sensor switching the lights off when the classroom was empty. The gray portions show the savings when the teacher switched the lighting to the AV mode. In this classroom, the AV mode lighting also had dimming control, and the cross-hatched area shows the additional savings due to dimming. Notice that the room was in the General lighting mode for most of the afternoon, so the savings would be even greater in during a day where the AV mode was used more often. (Reference: “Project 4.5 Final Report: Public Interest Energy Research Program,” California Energy Commission, October 2005.)

New York State Energy Research & Development Authority

The New York State Energy Research & Development Authority (NYSERDA) studied 28 classrooms in four middle or high school facilities and three higher education facilities. In each facility, four of the classrooms were outfitted with a classroom lighting system that included indirect-direct fixtures and controls to enable multi-modal switching (General mode and AV mode as defined by the CHPS and LEED for Schools ratings systems). The classroom controls systems also included occupancy sensors. The four test rooms in each school were compared to a “control” classroom that kept the existing lighting system in place. Monitoring equipment was installed to document usage patterns in each of the classrooms.

The table below shows the estimated annual energy savings due to the classroom lighting systems in the schools. Some of the savings reported were due to the efficient indirect/direct lighting system installed, and some from the classroom controls. Only the total savings were reported; savings due to individual control strategies were not determined. (Reference: “Classroom Lighting System Demonstration Research Study: Final Report,” New York State Energy Research & Development Authority, 2007)

Energy Savings with Indirect-Direct Classroom Lighting and Classroom Controls

	School	Location	Savings
Middle/High Schools	Hunter College Campus School	New York City, NY	55-60%
	Ray Middle School	Baldwinsville, NY	15-20%
	Scarsdale High School	Scarsdale, NY	60-65%
Universities	New School University	New York City, NY	20-25%
	Rensselaer Polytechnic Institute	Troy, NY	40-45%
	Syracuse University	Syracuse, NY	30-35%

*Note that one of the schools studied, Ballston Spa Middle School, had very low light levels in the existing classrooms. The new classroom lighting increased light levels in the existing classrooms by 30%, but also increased energy use.

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