



Getting the Green Light: Occupancy Sensors in SMCM Residence Halls



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Applied Sustainability Practicum

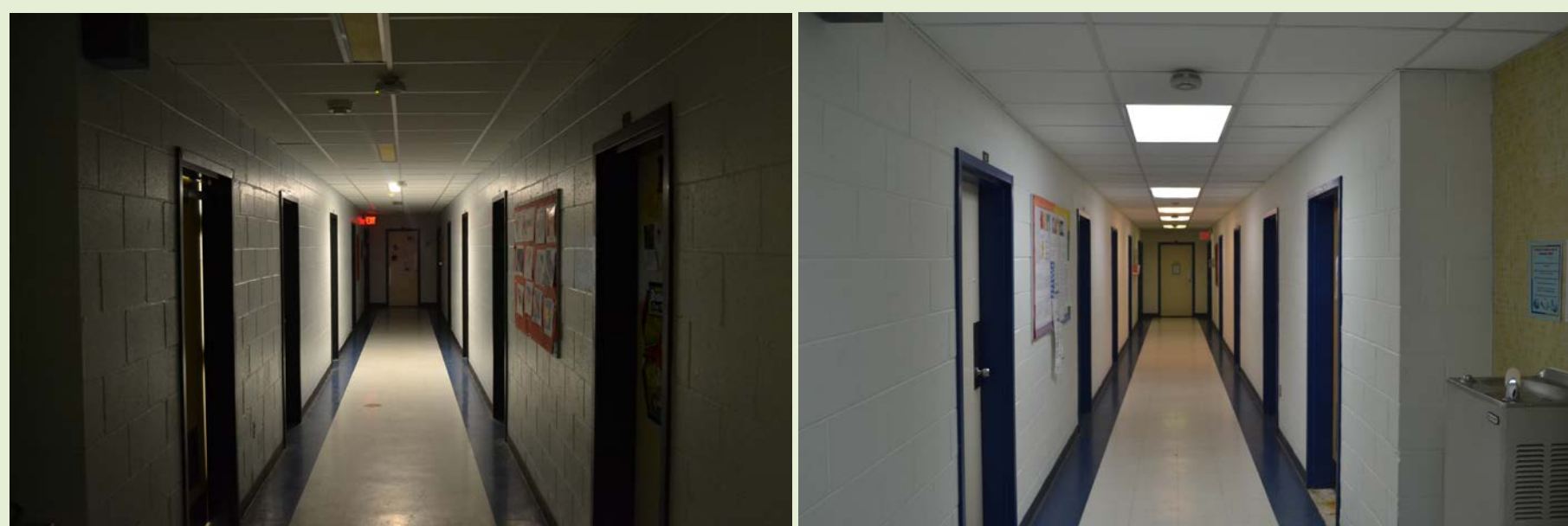
Abstract

In order to supplement campus efforts to reduce carbon emissions, I conducted significant research on energy efficient lighting technologies. Delving into the history of sustainable lighting at St. Mary's College, case studies from other institutions, and technical specifications of lighting options allowed me to make a logical decision on the best option to improve St. Mary's College. I found that occupancy sensors were a relatively simple way to save energy, and so devised a plan to implement occupancy sensors (motion sensor fixtures which turn off lights when the monitored space is not in use) into all of the dormitory hallways. In conjunction with the Sustainability Office and Student Government Association members, grant money has been secured to make this project a reality. When implemented, (in fall of 2015) these sensors will not only save energy and money, but teach a new generation of students the importance of ecological responsibility.

Process

The development of new technology raises the question of whether to retrofit or continue with the outdated model in place. After research on occupancy sensors, their pros and cons, I had to decide if it would be beneficial to make the switch. With every project there is a startup cost, or initial investment. A good project will pay back this investment, and a great project will have a short payback period. I found occupancy sensors to have a relatively short payback period. For the unit price, the payback period was under one year, and including installation costs I calculated payback in less than 5 years. Therefore the installation of these sensors would save the school money overall, while also reducing our reliance on fossil fuels.

After deducing that it would be beneficial to implement on the St. Mary's campus, it was a matter of securing funds, making plans, and deciding the scope of the project. Funds were secured with the help of the Sustainability Office and the Green St. Mary's Revolving Fund (GSMRF).



Lights on, lights off: Occupancy sensors would maintain needs such as safety while still reducing energy use. Images from Caroline (right) and Prince George (left.)

Scope of Project

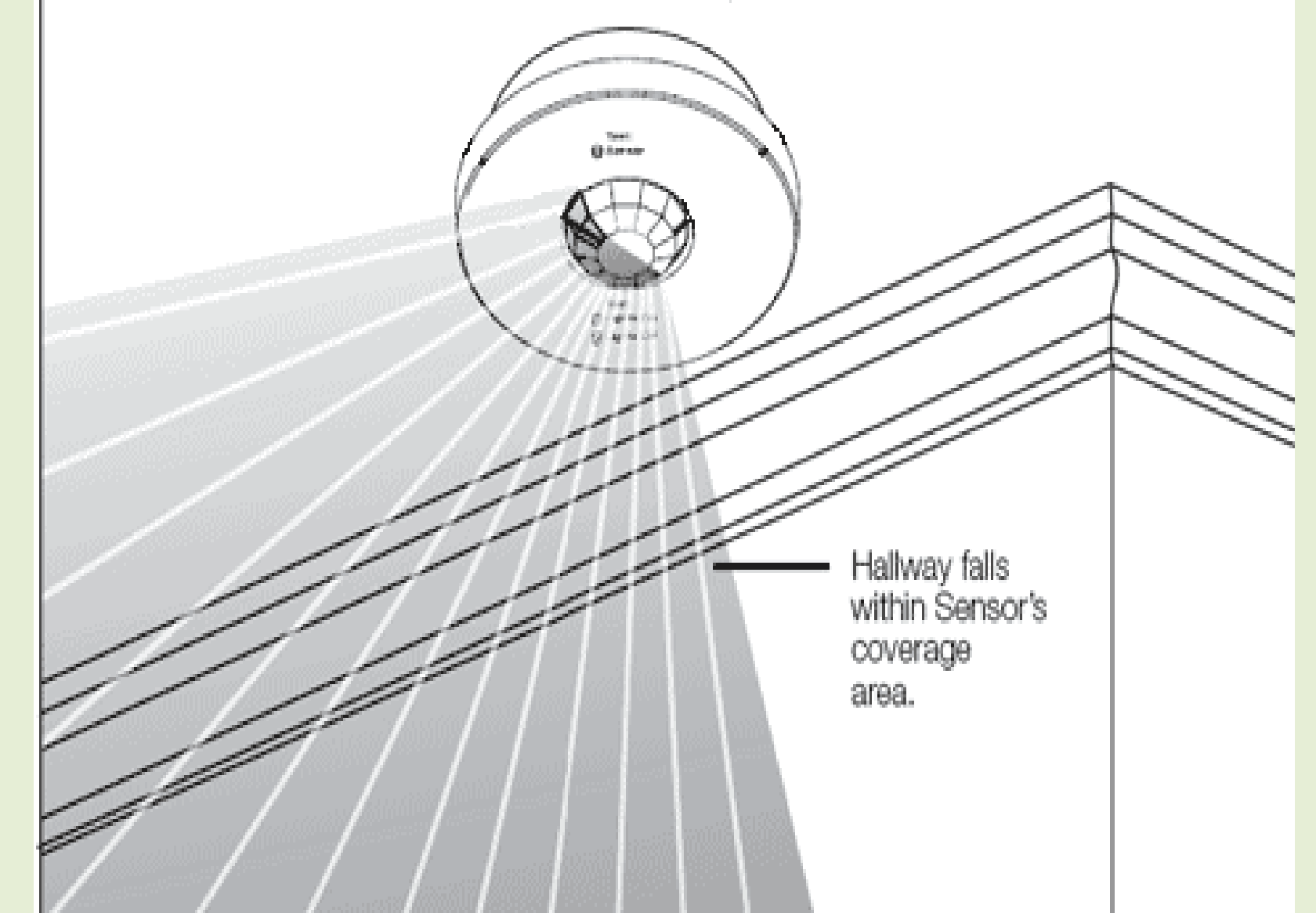
The project will be implemented in the Fall 2015 semester. Funds have been secured for installation in all four of the traditional residence halls. These halls are: Dorchester, Prince George, Caroline, and Queen Anne. The installation will consist of a rewiring of the light switches so that all hallway lights are controlled by overhead occupancy sensors.



Figure 1. Aerial view of St. Mary's College campus. Location of buildings to be retrofitted are marked with red.

Sensor Technology

The design of occupancy sensors is simple: the sensor employs infrared beams to detect human motion and presence.



When movement is detected, the switch is turned on. After a period of inactivity, for example ten minutes (this timer can be changed according to user acceptance) the fixture turns the switch off. By having several sensors per hallway, all wired to the same set of lights, the entire space can be monitored and no one will ever be left in the dark. These sensors are more than sustainable, they are convenient.

Calculations

Current Cost

Estimated 30 fixtures in each of the 4 residences

Lights burning 4620 hours a year (22 hours a day, 7 days a week, 15 weeks for 2 semesters a year)

72-watt fixtures, .072 kWh per hour

Average electrical cost: 12 cents per kilowatt hour

Current cost per building: **\$1,197.75**

x 4 buildings (Dorchester, Queen Anne's, Prince George, and Caroline)

Total current annual cost: **\$4,791**

Projected Reduction

Lights burning 1890 hours per year (with sensors) reducing figures from 22 hours a day to 9 hours a day

Reduced lighting use entered into original formula

Projected cost per building: **\$490**

Projected annual cost: **\$1960**

Total annual savings: \$2,831

Future Projects

This summer I am continuing my research with a project to implement sustainable lighting in the Boyden Gallery at SMCM with the goal of replacing the current incandescent light fixtures with more eco-friendly LEDs. In fall 2015, the occupancy sensor installation will begin. I plan to put up posters advertising the coming upgrade to students living in the buildings which will increase the conversation about sustainability at SMCM. I recommend the continuation of this project's process to academic buildings and any other applicable areas on campus. There are many efficient lighting opportunities to be investigated for the St. Mary's campus, such as retrofitting to LED lights, wide-spread occupancy sensors, and educational promotion.

Acknowledgements

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Works Cited

- "American University STARS Report" via Sierra Club, accessed April 8, 2015
- Barlett, Peggy F. and Geoffrey W. Chase. *Sustainability on Campus: Stories and Strategies for Change*. United States: Massachusetts Institute of Technology, 2004.
- Edwards, Andres R. *The Sustainability Revolution: portrait of a paradigm shift*. Canada: New Society Publishers, 2009.
- Orr, David. *Earth in Mind: On Education Environment and the Human Prospect*. Washington DC: First Island Press, 2004.