

Campus LED Streetlight Retrofit

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Abstract: This project would seek to reduce Humboldt State University's energy expenditures and indirect greenhouse gas emissions, reduce light pollution, and improve campus safety and visibility by retrofitting all existing campus street and pathway lights with efficient LED luminaires. Additionally, the project would install small educational placards around campus to communicate the effects of the project, including payback time, energy saved, and improved light quality to the university community.

Project Description

In March of 2011, Arcata conducted a pilot installation of 28 LED streetlights in the Valley West community off of Giuntoli Lane. The city estimated that the replacement of those existing high-pressure sodium fixtures saved 18,690 kilowatt-hours; nearly 700 kWh a year per fixture. Early in 2015, the city converted a majority of their 900 high-pressure sodium (HPS) streetlights to LED lights, saving an estimated 200,000 kWh per year. As of writing, most, if not all, of Humboldt State's cobrahead and pendant streetlights, "lollipop" and acorn-type pathway fixtures, and exterior building lights are still using antiquated, inefficient HPS technology. A 2009 study found that the simple act of switching lighting from older incandescent technology to LED is one of the most cost-effective ways to reduce greenhouse gases; the retrofits eventually pay for themselves (McKinsey 2009). With the university's commitment to environmental awareness and superb engineering and environmental science programs, the very fact that we are still using an inefficient technology from the 1960s seems incongruous, particularly when the city we reside in has already converted their lights. An LED retrofit has high potential to be a relatively easy, low-cost method of improving our campus's sustainability. This project would seek to achieve four main goals:

- Develop a geospatial inventory of campus-owned streetlights and pathway lights (perhaps including building-mounted exterior wallpacks)
- Develop an economic feasibility analysis of purchasing and installing LED streetlights and luminaires
- Decrease the amount of electricity consumed by campus, thus reducing both energy expenditures and indirect greenhouse gas emissions resulting from electricity consumption
- Improve campus safety and night visibility by improving the quality of light emitted from each of the university's streetlights

Need Statement

This project has the potential to meet the following goals:

The HEIF will achieve its mission through projects that are developed by students and, to the extent possible, implemented, monitored, and maintained with strong student involvement. This project will be developed entirely by students, with the possibility of some faculty, staff, and community involvement. Possible external partners include the Redwood Coast Energy Authority and the Schatz Energy Lab.

The HEIF will require accountability by measuring and reporting quantitative and qualitative results, as well as levels of involvement by students and other participants, in all its projects. The project will by nature generate quantitative and qualitative results. In order to execute this project to the highest quality possible, a simple economic feasibility study will take place, as will an analysis to approximate the magnitude of abated greenhouse gas emissions and the savings from avoided electricity consumption. A GIS map and dataset of existing fixtures, if not already existing, will be generated in order to facilitate installation of streetlights and other luminaires.

The HEIF will strive to make its projects derive from and be connected to the curriculum of the university.

The university has excellent environmental engineering and environmental science programs, and the Schatz Lab is a landmark institution on the north coast. A project such as this has the potential to encompass elements of curricula from various disciplines: engineering, geospatial sciences, economics, and energy policy just to name a few.

The HEIF will support dissemination of information about its projects through public outreach and educational activities.

Included in this project will be small, educational placards that passively educate passersby about the environmental and economic benefits of efficient lighting, especially with the north coast's long, dark winters.

The HEIF will seek to publicize accomplishments and experiences associated with its program and projects through a variety of media.

Local media, including the Lumberjack, Lost Coast Outpost, and North Coast Journal, could feasibly report on the story. Publicizing the lighting retrofit's goals, progress, and overall achievements on social media may provide an additional level of community engagement and education.

Outcome

Tangible expected results and benefits of the project include, but are not limited to: reduction of electricity consumption, furthering Humboldt State's goal of sustainability; reduction of indirect emissions resulting from electricity generation; improved campus safety through improved lighting quality; a communal sense of campus modernization and pride; and the reduction of energy costs derived from streetlighting. Student learning outcomes include development in: economics; conducting emissions, life-cycle, and energy analyses; product research and project design; and principles of roadway and public lighting.

Partners

There are several campus organizations, faculty and staff, and community organizations that have high potential to support this project. The Redwood Coast Energy Authority and the Schatz Energy Lab are both skilled, knowledgeable institutions that would be valuable resources during the course of the project. Possible faculty resources include Steve Hackett for the economic analysis, Kevin Fingerman and Arne Jacobsen for the environmental/GHG analysis, and Jim Graham for GIS work. Potential student partners could come from three programs: ERE, Environmental Science, and Economics.

Appendix

McKinsey & Co. "Marginal Abatement Curve". 2009.

http://petrolog.typepad.com/photos/blog_illustrations/GHG_abatement_costs_curve.jpg