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## Faculty Advisor

Nancy Governale-Hamill

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## Team Members

### Biofuel Subteam

Nicole Karns (Subteam Leader)

Vaibhav Gupta

Neha Padwal

Priyanka Patel

Michael Yee

### Lighting Subteam

Lidens Cheng (Subteam Leader)

Lauren Gillmeister

Jason Walker

Rachel Walker

Mayra Vega



# Lighting

# IPRO 337

# Zero Energy Lab

**contact  
US**

**<http://zeroenergylab.com/>**

## Background

The Zero Energy Lab is an ongoing project located on the fourth floor of Machinery Hall. The goal is to create a lab space that will become an energy neutral space. In its early days, the space was dedicated to metal smelting and processing, which later became a storage area. Despite an uneven concrete floor the space still held room for improvement.

## Problem

Lack of a proper lighting system to illuminate the space during non-daylight hours

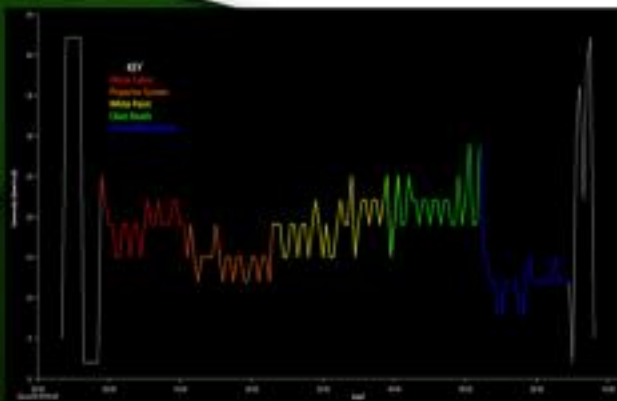


## Objective

- Apply different materials to a small section of the lab in order to determine which scatters light most efficiently
- Compare different types of lights and determine which kind produces the highest light intensity and the lowest amount of wattage used in the small section
- Determine which light fixture worked with the angle of the ceiling and the applied material, to create the most amount of light intensity
- Use results from this small section in order to design a lighting system that will make the Zero Energy Lab usable at all hours of the day

## Methodology

- In order to simulate a nighttime setting, a model of the Zero Energy Lab ceiling was created, which allowed the measurements of the light intensity\*
- Materials were tested to disperse light maximizing light intensity
- Materials tested: Photoluminescent Paint, Projection Screen, White Sheet, White Paint, White Paint and Glass Beads
- LED Light Fixtures versus Fluorescent Light Fixtures
- Measured the light intensity created by each lighting unit with similar wattage
- Painted a section of the ceiling white and applied glass beads on another section
- Measured the light intensity of each section with different LED light fixtures
- Measured the light intensity of each section during a night time



## Obstacles

- Creating and transporting a model of the Zero Energy Lab ceiling
- Painting the ceiling due to the height
- Attaching the beaded board to the ceiling

## Conclusion

In order to use the Zero Energy Lab to its fullest potential, lighting is necessary in the evening hours. Our IPRO team applied different materials to the ceiling that dispersed light most effectively, therefore saving energy from an overabundance of lighting fixtures. Based upon results from the light intensity test, the materials chosen were white paint and glass beads. Through our experiments we have found that the LED lights have a higher level of dispersion than fluorescent lights when testing with different materials. Therefore, this provides us with the data that indicates that LED lights are the more appropriate choice when combined with the white paint and glass beads.

## Future Goals

- Determine which LED light fixture is the most energy efficient
- Modify the existing floor plan of the Zero Energy Lab to include a workable LED lighting system
- Include a light sensor and dimmer system
- Electrical wiring of the LED light fixtures



- Use DC energy from the battery bank
- Apply the materials determined from the test to the entire ceiling of the Zero Energy Lab