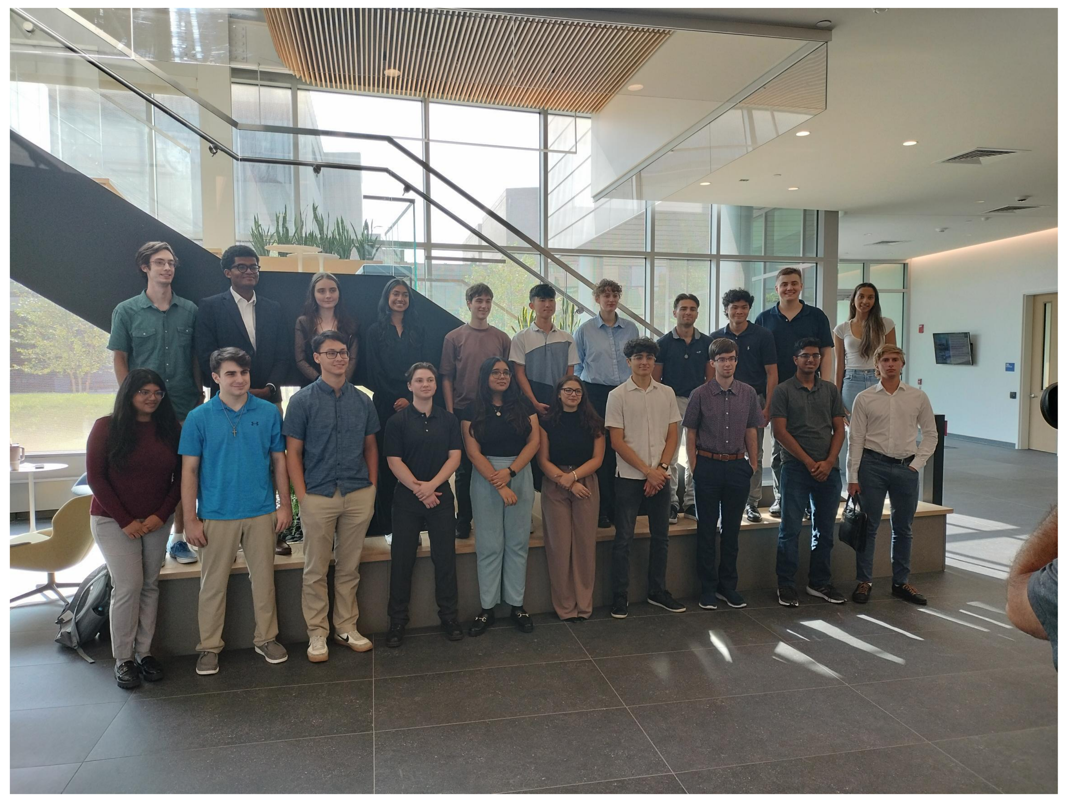
CLCPA, NYSERDA, Walden and Hofstra: Getting to Net-Zero One Building at a Time

Raymond Spinelli, Senior Engineering Science, Joseph Heaney, Walden Environmental Engineering, Dr. Lynn Albers

Fred DeMatteis School of Engineering and Applied Science

Overview

This project investigates energy consumption and lighting systems in selected buildings on Hofstra University's Campus. We aim to quantify energy costs and identify alternatives for improving energy efficiency and reducing Hofstra's carbon emissions. The research was conducted over the summer as part of Hofstra's ASPiRe Program. The Advanced Summer Program in Research (ASPiRe) is a 10-week, intensive program for students interested in pursuing a research project related to their major under the guidance of a faculty mentor. It was a pleasure to have mentorship from Hofstra's Engineering department, Dr. Lynn Albers, and Walden Environmental Engineering's CEO, Joseph Heaney, throughout the project.



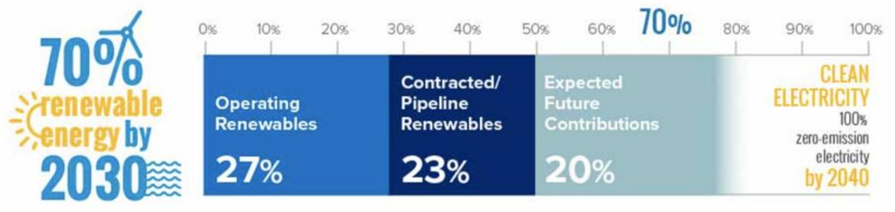
ASPiRe 2024 Group Photo

Background & Objectives

On July 18th, 2019, New York State signed the ambitious Climate Leadership and Community Protection Act (Climate Act). The Climate Act set statewide goals for reducing greenhouse gas emissions 40% by 2030 and 85% by 2050 compared to the levels measured in 1990. Additionally, the Act set goals to have 70% of state electricity generated from renewable energy by 2030, and a transition to 100% zero-emission electricity by 2040.

The Climate Act also called for the assembly of a Climate Action Council. It tasked the council with creating a Scoping Plan containing recommendations for New York State to achieve the Climate Act's goals while focusing on disadvantaged communities. The Scoping Plan was completed on September 19th, 2022, and includes suggested actions across the seven sectors, such as creating enforced energy efficiency performance standards and benchmarking, and the requirement for energy-efficient lighting for all buildings over 25,000 sqft.

The objective of our research was to assess the current energy usage of campus buildings, analyze the data collected, and propose actionable recommendations to enhance energy efficiency and minimize carbon emissions in line with New York State's Climate Leadership and Community Protection Act (CLCPA).



Methodology

Two components of a Building Energy Audit were investigated: Energy Consumption and Lighting Systems. The energy use for the Fred DeMatteis School of Engineering and Applied Science's computer lab (Figure 2) in Weed Hall (Figure 1) was monitored using a Hobo Data Logger (Figure 3) and the data (Figure 4) was imported into a MATLAB file. The created MATLAB program calculates and graphs the kilowatt-hour usage per day from the current reading data.

Figure 1: Hofstra University's Weed Hall

Figure 2: Weed Hall's Lab

Figure 3: Hobo Data Logger

Figure 2: Data from Hobo Logger

The lighting system of Hofstra's Physical Plant (Figure 5) was a fantastic place to start because the building is still mostly using T-8 fluorescent bulbs. A walk-through was done to obtain an inventory of the model, type, and amount of the various fixtures (Figure 6), bulbs (Figure 7), and Ballasts (Figure 8). The kilowatt-hour usage can then be estimated by using the specifications of each component and making a few assumptions about operation hours. Furthermore, the savings can be analyzed if there was a retrofit.

Figure 5: Hofstra University's Physical Plant

Figure 6: 2-Bulb Fixture

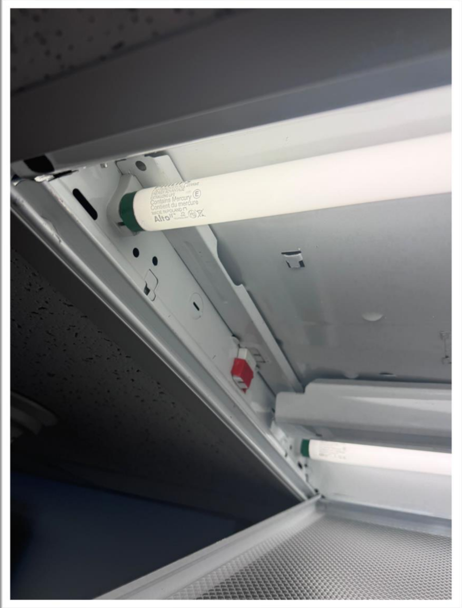
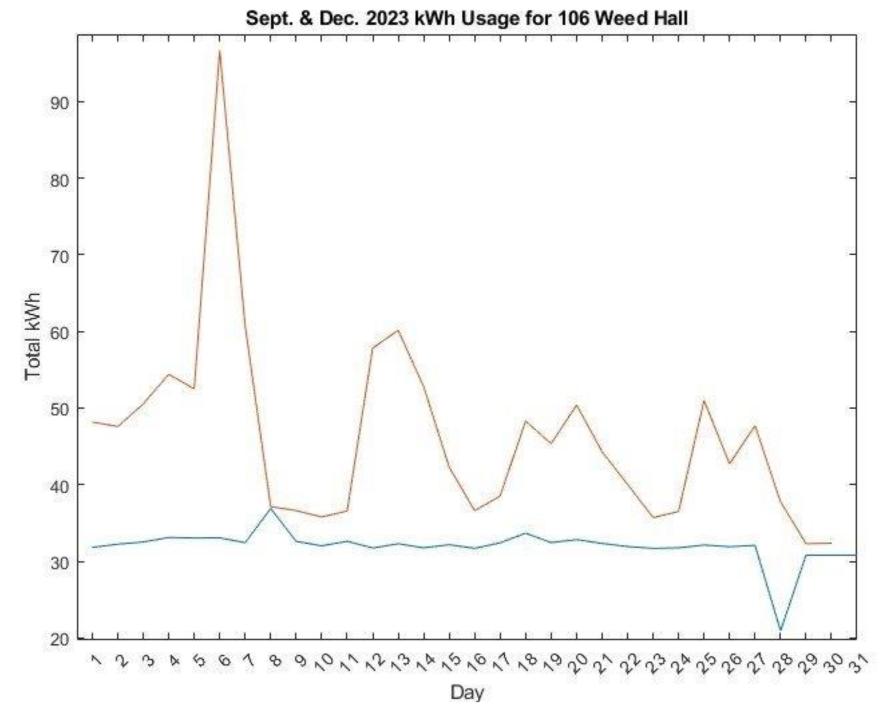
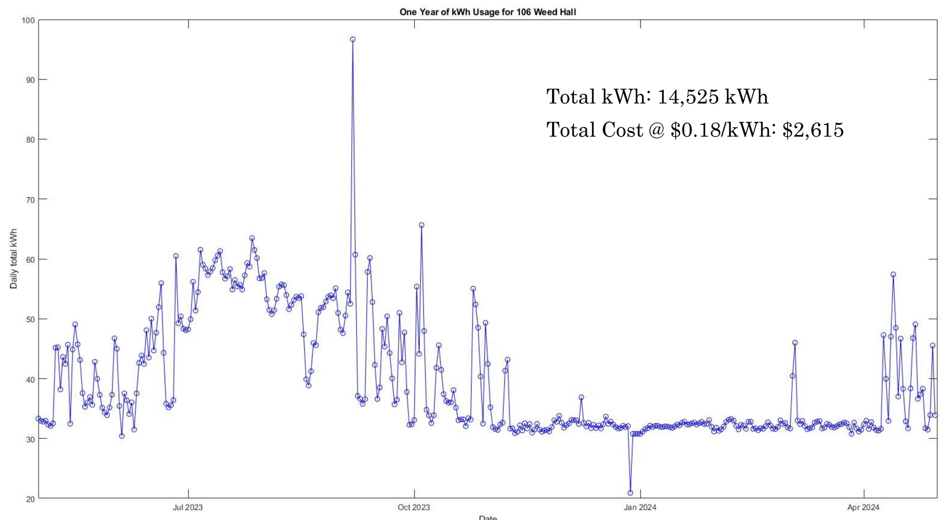


Figure 7: 25W T-8s

Figure 8: Ballast

Results





Examples of Estimated Combined Electric and Power Usage for Lighting		
24/7/365 (kWh)	10 hr, 250 workdays (kWh)	8 hr, 250 workdays (kWh)
241287	68861	55088
Cost at $0.18/kWh		
$43,432	$12,395	$9,916

Figure 9: Estimated kWh Usage for Physical Plant

	Savings Associated when Retrofitting all 1,140 T8 bulbs with 13W LED bulbs via Plug-and-Play		
	24/7/365	10 hr, 250 workdays	8 hr, 250 workdays
kWh	113,997	32,534	26,027
Cost $0.18/kWh	$ 20,520	$ 5,856	$ 4,685
kWh Saved	127,290	36,327	42,834
Costs Saved	$ 22,912	$ 6,539	$ 7,710
Savings compared to T8s 10 hr, 250 days			

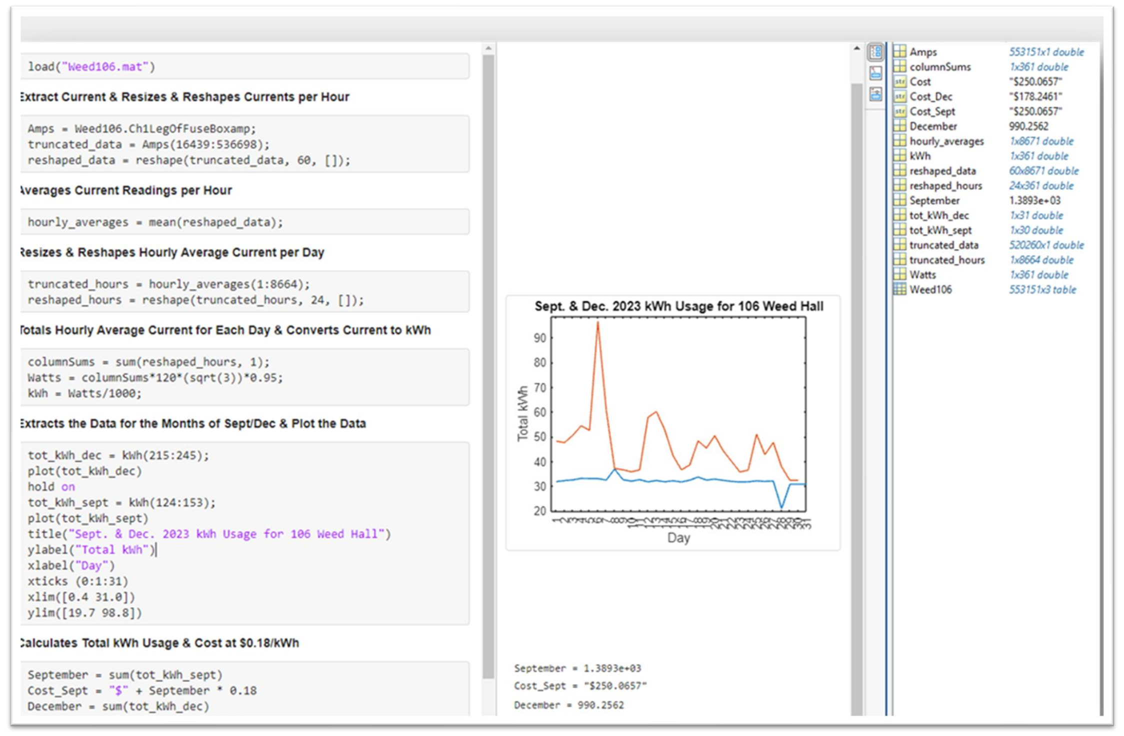
Figure 10: Savings and kWh Usage for Type-A LED Retrofit

	Savings Associated when Retrofitting all 1,140 T8 bulbs with 12W LED bulbs via ballast bypass		
	24/7/365	10 hr, 250 workdays	8 hr, 250 workdays
kWh	119,238	34,029	27,223
Cost $0.18/kWh	$ 21,463	$ 6,125	$ 4,900
kWh Saved	122,049	34,832	41,638
Costs Saved	$ 21,969	$ 6,270	$ 7,495
Savings compared to T8s 10 hr, 250 days			

Figure 11: Savings and kWh Usage for Type-B LED Retrofit

Conclusion

The findings demonstrate that even minor changes in energy use can result in significant cost reductions when applied across campus buildings, supporting a sustainable future for the university and the state. This research sets the stage for expanding the Energy Auditing Process on more buildings, as well as, investigating other components of the process such as building envelopes and HVAC systems.



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