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Problem Statement

The goal of this project is to create a more efficient, cost effective, and heat dissipating device that can be compared to a traditional solar cell. Tests will be needed to compare the power generation of different LED colors and configurations, as well as light transfer through 3D printed waveguides. A testing rig needed to be created to simulate the irradiance pattern of the sun in a lab environment to have a consistent method of experimental results.

Customer Background

The leading device to generate power from solar energy is a solar energy is a solar panel but they're an expensive solution for their inefficiency due to reflected light and heat build-up. Commercial panels are only between 13-24% efficient at converting light.

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			A	Aulticrystalline Si		23.3%
			N	Aulti-junction Galli	um arsenide (GaAs)	47.6%
			Thin film	admium telluride	(CdTe)	22.39
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Soet Research Day, 2024

Waveguide Light Development



Figure 9: The lens, 3D Geometry, and LED array all held together by a printed holder







Figure 14: Testing Results for different angled setups



Figure 15: Power vs. Voltage Comparison of Various Waveguides Max power using last year's design: 0.0000117 W Max power using this year's design: 0.000149 W Precent Increase in power: 1173%



Polytechnic Institute



Figure 12: Testing of 0° angle



Figure 13: Testing of 90° piece bend



Figure 16: Max Power Comparison of Array vs. Solar Panel Max Power Equal Active Area Solar Panel: 0.0002 Max Power Equal Active Area IR Array: 0.00117 Percent Increase in Power Generation: 485%