



**Florida Tech**  
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# Cost Savings of LED Lighted Runways

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## Abstract

Runway lighting is both a critical safety feature at airports and an area that can be updated to increase airport sustainability. In this study we evaluated the cost reduction associated with transitioning airport runway lighting to light-emitting diode (LED), to identify the costs savings that an airport can achieve in being more environmentally sustainable. We compared utilities costs before and after the switch at Naples Municipal Airport and Jacksonville International Airport and found there was a reduction in costs with LED lighting.

## Background

Airports are large users of energy. Li, Zhang, Wang, Xu, and Su (2017) documented that in China civil aviation accounted for around 8% of the transportation industry's energy consumption, with airports using about 3% of the aviation industry's total. Boiral, Ebrahimi, Kuyken, and Talbot (2017) found that small airports tend to undertake sustainability initiatives that are relatively unstructured and informal because they often see environmental issues as something that will hurt their bottom line.

Runway lighting is important in maintaining the safety and efficiency of flight operations at an airport. Montes, Vázquez, Fernandez-Balbuena, and Bernabeu (2014) found that LED lighting is the most efficient form of lighting for runways. LEDs are more efficient due to the lower power consumption, ability to be controlled remotely, and reduced frequency of maintenance and bulb replacement.

## Purpose and Research Question

The purpose of this study was to evaluate the reduction in utilities costs at Naples and Jacksonville associated with the installation of LED lighting on airport runways.

Does switching to LED runway lighting reduce the utilities costs for airports?

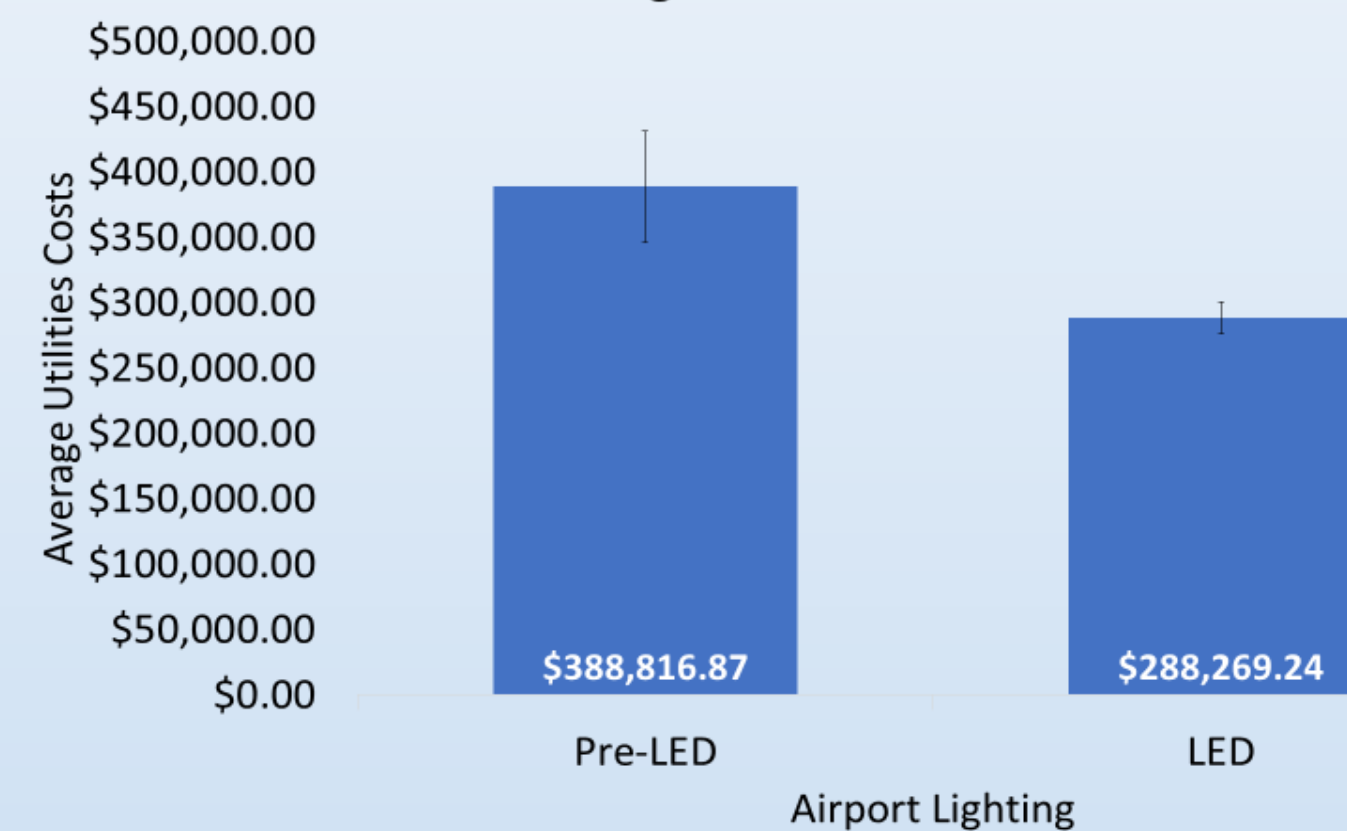
## Methods

1. Used AIP grant list to find airports that underwent "Lighting Rehabilitation".
2. Found the financial data for the selected airports from the airports website, then adjusted the cost for inflation.
3. Contacted the Airports District Office (ADO) and Airport officials to determine when airports switched to LED lighting systems.
4. Calculated descriptive statistics using Excel, performed a t-test using Rstudio, and calculated Cohen's d.

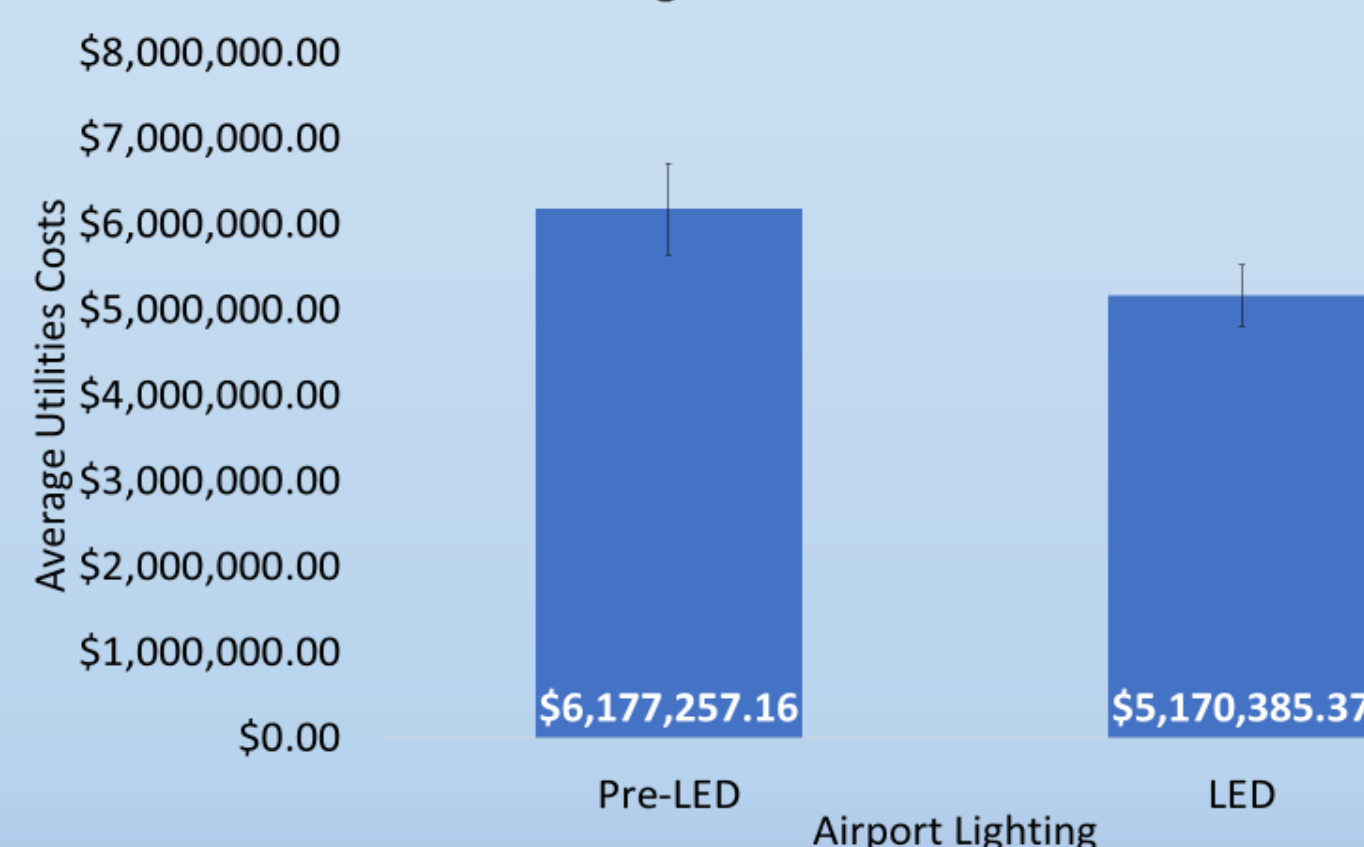
## Results

In the Naples' t-test, there was a significant effect from changing to LEDs,  $t(2.7) = -4.03$ ,  $p = 0.05$ . The Cohen's d was 3.29, which is a very large effect size. In the Jacksonville t-test there was a significant effect from changing to LEDs,  $t(5.99) = -3.35$ ,  $p = 0.02$ . The Cohen's d was 2.21, which is a very large effect size. Both Naples and Jacksonville had reduced costs after changing to LED lighting.

Naples Municipal Airport  
Average Utilities Costs



Jacksonville International Airport  
Average Utilities Costs



## Discussion

We analyzed 10 years of financial data for Naples Municipal and Jacksonville International Airport. The data does support our hypothesis that switching to LED runway lighting would reduce utilities costs for airports. Our data analysis shows that there is a statistical difference between pre-LED and LED lighting, and the utilities costs with LEDs are lower. Naples Municipal Airport saw their utility bill decreased by 25% on average, while Jacksonville saw an average decrease of approximately 16% in average utilities costs.

A limitation of the study is that utilities costs comprises of electric costs, water, garbage disposal and more. As a result, other components of the utilities cost may be responsible for the decreased costs. Also, the small sample size makes it difficult to generalize, and with LEDs being a relatively new technology, they have not been in use for airfield lighting for many years. This limits the years of data available for LED airfield lighting at the airports.

## Future Research

We suggest a case study for a single airport with an electrical monitor to collect data on the kilowatt-hours of electricity used by the airfield lighting system. We also suggest conducting a survey at airports to better understand if they would be more willing to switch to LED runway lighting knowing the cost reduction.

## References

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