Journal of Physics Special Topics
An undergraduate physics journal

P1_1 Hollywood Sign Illuminations: Is it Worth the Money?

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October 23, 2022

Abstract

In this paper, an investigation is conducted as to whether it is financially viable for the famous Hollywood sign in California to be lit up by Light Emitting Diodes (LEDs) for 12 hours. By estimating the surface area of the Hollywood sign, we calculated the number of LEDs required to fully cover the sign and the power of each LED. We estimated the cost to illuminate the Hollywood sign for 12 hours to be approximately $11,000 (2 s.f). Therefore, we think it is financially viable to illuminate the Hollywood sign for a single event. However, considering installation and maintenance costs we do not think this would be a financially viable project for long term use.

Introduction

Currently, the Hollywood sign is not lit up at night, but this has not always been the case. According to the chair of the Hollywood sign trust, Jeff Zarrinnam, the Hollywood sign was first illuminated on 8th December 1923 with flashing light bulbs [1]. In this investigation, we aim to find out whether it would be financially possible to illuminate the sign once more for 12 hours during the night.

We have chosen to use LEDs to illuminate the Hollywood sign in this paper because LEDs are a lot more power efficient than incandescent lighting. LEDs use 75% less energy than incandescent lighting so would be considerably less expensive to run [2].

Theory

To best light the Hollywood Sign we have chosen white light LEDs. We felt white light would best match the existing sign, what follows in this section is a brief explanation as to how LEDs work.

An LED is made up of semiconducting materials and a boundary between them. This boundary is called a PN junction. An external voltage, or forward bias, flows from the positive to negative side of the junction, P and N sides respectively [3]. On the positive side of the junction voltage builds up and particles with sufficient energy pass over the junction and release energy as photon pulses, therefore lighting up as current passes through [4].

LEDs are a more efficient lighting method than traditional filament bulbs. LEDs use over 75% less energy that incandescent lighting, due to the fact that the process described above gives off almost no heat meaning power is not wasted through heat loss [4].

Results

Due to a lack of official data, we had to estimate the surface area of the sign as there is no credible published value. It was found that the entire sign is 13.7 m tall and 106.7 m wide [5]. We have taken an overestimate by modelling

the sign as a full rectangle and an underestimate by halving the surface area of our rectangular model. The average of our over and underestimates give a surface area of 1100 m^2 (2 s.f). To cover this surface area in LEDs of diameter 5.0 mm [6], 56 million (2 s.f) are required. In order to estimate the cost to run, the power for each LED is required. Using

$$P = IV, \tag{1}$$

where P is power in Watts, I is current in Amps and V is voltage in Volts, the power of each LED can be found. Taking standard values from literature, we have assumed a voltage of 3.5 V for an industry standard white LED [7] with a current of 20 mA [8]. This yields a power of 0.07 W per LED. Therefore, the total power to run the sign is 3,900,000 W. To run the sign for 12 hours this value equates to 47,000 kWh . In California, electricity is currently 0.23 $/kWh [9]. This gives an average estimated cost of around $11,000 for 12 hours of light.

Discussion

Based on the Hollywood Sign Trust's tax information for the 2020 tax year, we believe that it is financially viable for the sign to be illuminated for a one-off event for 12 hours. The Hollywood's sign tax revenue information states that they had an excess of $62,658 [10] which is considerably more than the $11,000 needed for this project.

During our initial research, we were unable to find accurate measurements of the dimensions for the Hollywood sign, this information would give future researchers a more accurate result.

In order to get a more comprehensive cost analysis of this ambitious proposal the upfront, installation and maintenance costs of 56 million LEDs must be taken into consideration.

Conclusion

In this report we analysed and identified the viability of lighting the iconic Hollywood sign with LEDs. Through estimation and calculation, $11,000 was the final cost concluded for 12 hours of continuous light from approximately 56 million LEDs.

According to the Hollywood's sign tax revenue information it is financially viable that a one-off 12-hour lighting event could take place. However, due to the other costs associated with this project (for example, installation and maintenance) we believe lighting up the Hollywood sign for any period of time would be an unnecessary strain on a country's resources and could face backlash from the local community.

References

[1] https://lajournalmag.com/why-isnt-the-hollywood-sign-lighted-at-night/ [Accessed 3 October 2022].

[2] https://blog.arcadia.com/led-vs-regular-lightbulbs-do-they-really-make-a-difference/ [Accessed 3 October 2022].

[3] Tipler, P. and Mosca, G., 2008. Physics for scientists and engineers with modern physics.

[4] https://www.britannica.com/technology/LED [Accessed 3 October 2022].

[5] https://www.hollywoodsign.org/resources [Accessed 3 October 2022]

[6] https://www.make-it.ca/5mm-led-specifications/ [Accessed 3 October 2022].

[7] https://www.ti.com/lit/wp/slva130/slva130.pdf [Accessed 3 October 2022]

[8] https://www.electronics-tutorials.ws/diode/diode8.html [Accessed 3 October 2022]

[9] https://www.energysage.com/local-data/electricity-cost/ca/los-angeles-county/north-hollywood/ [Accessed 3 October 2022]

[10] https://www.hollywoodsign.org/tax-information [Accessed 3 October 2022]