

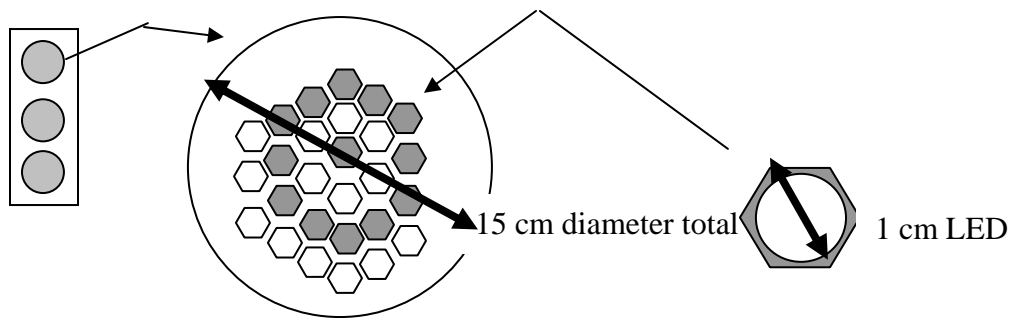
The JETS Challenge

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Challenge 69 – The LED Challenge

Problem:

New traffic lights use Light Emitting Diode (LED) technology, which is very energy efficient. Each LED consumes only 0.08 watts of power, compared to the 100 watts that a each conventional incandescent light (red / yellow / green) uses in the traditional traffic light. Each LED light measures 1 cm in diameter. A matrix of them mounted in a hexagonal tiling pattern (honeycomb) creates the equivalent of a conventional 15 cm diameter lens. A typical major intersection would have three lanes (two straight + one left turn) in each direction crossed by two lanes (straight + left turn) in the other direction. This means a total of 10 traffic lights with three lights (red/yellow/green) in each lane. The lights operate continuously year-round.



If the lights into this campus are replaced with the new LED technology, how many watt-hours (watts times the number of hours of operation) of electricity could be saved each year?

Solution:

$$\begin{aligned} \text{Traditional traffic light: } & 100 \text{ watts/light} \times 10 = 1,000 \text{ W} \\ & \times \underline{8,760 \text{ hours/ 1 year}} \\ & 8,760,000 \text{ WH} \end{aligned}$$

New Light

$$\begin{aligned} \# \text{ LEDs in one color} & \quad 169 \text{ LED} \\ & \times \underline{.08U} \\ & 13.52 \text{ W} \times 10 = 135.2 \text{ W} \\ & \quad \times \underline{8,760 \text{ h}} \\ & 1,184,352 \text{ W-H} \end{aligned}$$

Watt-hour saved for 10 lights:

$$8,760,000 - 1,184,352 = 7,575,648 \text{ Watt hours or } 7,576 \text{ KWH}$$