## Commercial Lighting To ET2020 LEDs

### Author

Andrew Parker, NREL

### Description

### Light-emitting diodes (LEDs), a type of solid-state lighting (SSL), offer the electric lighting market a new and revolutionary light source that saves energy and improves light quality, performance, and service. Today, white-light LEDs are competing or are poised to compete successfully with conventional lighting sources across a variety of general illumination applications due to their ability to offer high quality and cost-effective performance. By 2020 DOE ET has an efficacy goal of 193 lm/W, which is roughly double the current state-of-the-art T8 linear fluorescent lighting.

### Modeler Description

Assume that the starting point technology is primarily 90.1-2013 T8 lighting, with an efficacy of 90 lm/W. According to Table 5.2, LED Efficacy Improvement, in (1), 2015 LED luminaire efficacy is 145 lm/W. Calculate the total lighting power of the model and divide by this initial efficacy to determine the total number of lumens needed. Assuming that this same number of lumens should be provided by LED lighting, divide by the LED efficacy to determine the total wattage of LEDs that would be necessary to achieve the same lighting. Reduce the overall building lighting power by the resulting multiplier. IE new LPD = old LPD \* (1 – 90lm/W /193 lm/W).

This is a very crude estimate of the impact of current LED technology. In order to perform a more nuanced analysis, lighting in the prototype buildings should be broken down by use type (general space lighting, task lighting, etc.) and by currently assumed technology (T12, T8, metal halide, etc.). If this breakdown were available, each type of lighting could be modified according to its own efficacy characteristics. Additionally, this measure does not account for the impact of LEDs on outdoor lighting.

### Use Case Types

Retrofit, New Construction

### Arguments

“run\_measure” is a choice argument that determines whether or not the Measure is applied during a given run.

### Initial Condition Message

The initial model had XX W of lighting. Assuming 90 lm/W, this equates to YY lumens.

### Final Condition Message

The final model had YY W of lighting, after assuming all existing lighting was replaced by LED lighting with an efficacy of 193 lm/W.

### Not Applicable Messages

Not applicable if the building has no lighting.

### Warning Messages

Warn if a particular lighting definition uses no power.

### Information Messages

List the assumed initial efficacy and the assumed final efficacy.

### Error Messages

### Code Outline

* Determine the lighting power reduction multiplier as a ratio of the initial to final assumed efficacies.
* Find all lights definitions
* Edit their lighting power based on the lighting power reduction multiplier

### Tests

**This measure applies to:**

1. Large Office
2. Medium Office
3. Primary School
4. Secondary School
5. Large Hotel
6. Hospital
7. Small Office
8. Stand-Alone Retail
9. Strip Mall
10. Supermarket
11. Quick Service Restaurant
12. Full Service Restaurant
13. Small Hotel
14. Outpatient Healthcare
15. Warehouse
16. Midrise Apartment

**Test results:**

### References

1. <http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/ssl_energy-savings-report_jan-2012.pdf>
2. <http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/nichefinalreport_january2011.pdf>