2020-2023 Efficiency Plan

Efficiency Manitoba Undertaking #1

Efficiency Manitoba is to pick one of the LED lighting programs, and advise how Efficiency Manitoba accounts for the electric interactive effects and the savings for that measure.

Response:

The following example outlines the electric interactive effects on a conversion of a halogen light bulb to an LED light bulb in a home with electric heat and air conditioning.

The base technology used in the example is a 43 watt halogen bulb which provides the equivalent light output of a 60 watt incandescent bulb. To calculate the annual energy consumption the wattage is divided by 1,000 to convert to kilowatts and then multiplied by the assumed 888 annual hours of operation to arrive at 38.2 kWh.

The energy efficient technology in this example is a 9.5 watt LED bulb which provides the equivalent light output of a 60 watt incandescent bulb. The annual energy consumption is calculated similarly to the base technology to arrive at 8.4 KWh.

The difference between the two technologies is the gross annual energy savings of 29.7 kWh.

The assumptions used to determine the increased heating and the decreased cooling requirements is based on a 1994 Canadian Electricity Association Report Assessment of The Impact of Internal Gains on the Thermal Loads in the Residential Sector[1]. Similar methods are used for commercial buildings using methods published by ASHRAE/IES.

The increased heating requirement resulting from the installation of the LED bulb are determined by calculating the gross annual energy savings by a factor of 74.2%. This increase is equal to 22.1 kWh.

The decreased cooling requirement is equal to the gross annual energy savings multiplied by a factor of 11.5% and then divided by the Coefficient of Performance (COP) of 3 and further divided by a sensible heat factor of 0.9. This decrease is equal to 1.3 kWh.

[1] Assessment of the Impact of Internal Gains on the Thermal Loads in the Residential Sector, Report for the Canadian Electrical Association prepared by Hydro-Quebec, No. 9102 U 849, December 1994.

The net electric savings after heating and cooling interactive effects in this example are 8.9 kWh.

	Watts		Annual Hours		Watts		Convert to kW.h		kW.h
Base technology - 60 watt equivalent halogen	43	x	888	=	38,184	÷	1000	=	38.2
EE technology - 60 watt equivalent LED	9.5	x	888	=	8,436	÷	1000	=	8.4
Gross energy savings per bulb									29.7
Less - Percentage increase in heating load (gross kW.h x 74.2%)								-	22.1
Plus - Percentage decrease in cooling load (gross kW.h x 11.5% ÷ 3 ÷ 0.9)								+	1.3
Net electric savings after electric interactive effects								=	8.9

Note: Values may not add up exactly due to rounding.