Technology: LED lights

Definition and description

Light emitting diodes (LED) are semiconductors that transform electricity to light in a very efficient manner. Invented in 1962, it took LEDs more than forty years to advance from a niche application to a mainstream light source. Due to their superior efficiency, their longevity, their low environmental concerns, their variability in regard to size (accumulation of diodes), color, and intensity, LEDs have become the fastest growing lighting technology. In 2017 approx. 12 % of all lights installed globally and more than 25 % of newly sold lights have been LEDs. This makes LEDs the only technology with increasing sales numbers while sales of all other technologies are either stagnating or decreasing.

In addition to the undisputed efficiency of LEDs, longevity is often an issue. Depending on the quality of the semiconductor material, the assembly, the environmental conditions (temperature and humidity) as well as the quality of electric supply, LEDs can last up to 100,000 hours of operation. In contrast incandescent light bulbs usually only last 1,000 hours. However, complaints have been made that normal consumer type LEDs don't fulfil the expectations. In order to address these concerns there are two different types of LED failure. One is the complete failure of the device, which is usually an assembly problem, and the other one is the reduction of efficacy as a result of the degradation of the semiconductor. Even cheap semiconductors should allow for a lifetime of 10,000 to 15,000 hours of operation. Lifetime in this case means that the devices still emit 50 % of their nominal value. Completely failing devices on the other hand are an indication of either deficient assembly or serious issues with the quality of electricity. This said, customers should be informed and look for certifications and manufacturer guarantees.

Potential in Grenada[12]

Given the undisputed advantages of LED lighting devices, this technology has the potential to cover 100 % of the market. However, attributing a number of lighting devices to those 100 % is difficult without knowledge of existing units of any technology in the country.

Mitigation to climate

In order to estimate the greenhouse gas mitigation potential several assumptions have to be made. It is fairly easy to determine the energy saving potential of LEDs compared to CFLs and incandescent light bulbs or other technologies based on their rated wattage. However, the question is how big is the share of each technology today and how many hours are the different technologies operated on average. Furthermore the total consumption of the lighting sector has to be estimated.

The average global share of the lighting sector in electricity demand is approx. 15 %. On a global scale, today's shares of the various technologies are as follows: fluorescent technologies 66%; LEDs 12 %; halogen and others 10 %; and incandescents 2 %. These numbers will most likely

[12] Due to the lack of detailed analyses the demand /potential has been estimated based on assumptions.

not cover the situation in Grenada. Consequently, the following assumptions have been made: fluorescent technologies 65%; LEDs 5 %; halogen and others 10 %; and incandescents 20 %.

Based on these assumptions, shifting completely to LEDs could reduce energy consumption by nearly 70 %, this directly translates to the mitigation potential. Further based on Grenada's 2016 electricity generation, and assuming 15 % are attributed to lighting, using only LEDs could reduce Grenada's greenhouse gas emissions by 14 kT[13] of CO_2 equivalent.

Advantage(s)

- High energy saving potential
- High lifetime
- Low lifecycle cost
- Low environmental concerns

Disadvantage(s)

- High upfront costs
- Disposal of replaced fluorescent devices bears environmental risks

Costs and other financial requirements

Currently, standard LED bulbs are available in Grenada at costs between 15 XCD and 40 XCD. Consequently, when compared to incandescent light bulbs they are quite expensive. Furthermore, it has to be assumed that the cheaper once are of lower quality.

However, due to their lower consumption and longer lifespan, lifecycle costs of LEDs are unbeaten. Lifecycle costs means the overall cost including consumption and replacement. For example: a quality LED may cost 40 XCD. It will last 15,000 hours of operation and consume 105 kWh or at today's electricity tariffs 94.50 XCD. Hence the lifecycle cost is 134.5 XCD. An incandescent only costs 2 XCD. However it will only last 1,000 hours. Consequently you need 15 of them. Furthermore those 15 bulbs will consume 900 kWh costing 810 XCD. The comparable lifecycle cost is 840 XCD.

Depending on quality and price of LEDs their lifecycle cost is between 75 % and 90 % lower than that of incandescents and between 30 % and 70 % of fluorescent devices.

Status of the technology in Grenada

LEDs are available and used in Grenada. Exact numbers are not known.

[13] Based on UNFCCC "Standardised baseline: Grid emission factor for Grenada" and an electricity generation distribution of 95.7 % in Grenada, 3.9 % in Carriacou and 0.4 % in Petite Martinique.