

Green Productivity: The carbon footprint and LED lighting technology

Estimates suggest that almost half of our carbon footprint is due to electricity and 17% is due to lighting alone. We depend on electricity to meet several of our daily requirements. Electricity can be produced by coal, gas, or nuclear plants or by renewable sources like geothermal, hydro, solar, and wind power. The carbon footprint of a household or person is directly correlated with the amount of electricity consumed and its source. Table 1 shows the grams of CO₂ equivalent produced when 1 KWh of electricity is produced from different sources. Most of the electricity is produced by fossil fuel-burning plants, and once the losses in transmission and distribution are accounted for it is estimated that each KWh of electricity that a household consumes releases 830 g of CO₂ equivalents in the air.

Table 1. Grams of CO₂ produced when generating 1 KWh of electricity by source.

Source	Grams of CO ₂ produced
Coal	955
Oil	893
Natural gas	650
Nuclear energy	60
Hydropower	15
Solar energy	40

Save electricity: Reduce carbon emissions

Since almost 830 g of carbon equivalents are released in the consumption of 1 KWh of electricity, it follows that carbon emissions can be reduced if electricity consumption is reduced. Replacing an old refrigerator, installing movement sensors, and unplugging instruments when not in use are some methods we may employ depending on the availability of time and monetary resources. However, there is one investment in energy-saving instruments which is certain to generate a handsome return.

Replace incandescent bulbs with LED lighting

LED lamps and tubes not only consume a fraction of the energy consumed by incandescent bulbs, they have the double benefit of lasting almost forever and containing no mercury. By doing nothing except installing LEDs in the home, it is possible to reduce your carbon footprint by a whopping 6 tons per year. To put it in perspective, this saving of 6 tons is equivalent

to reducing gasoline consumption by 700 gallons. The added benefit is that LED lights give at least 10 years of hassle-free service. Some people criticize LED lighting for being expensive but cost-benefit analysis shows that LED lamps deliver a minimum of 6% annual return in running costs alone (Table 2).

Table 2. Comparative advantages of LED over incandescent lighting.

	Incandescent	LED
Power consumption (W)	50	6
KWh (units of electricity used/hour)	0.05	0.006
Hours of operation/day	10	10
Carbon emissions (tons)/year/lamp	0.152083	0.01825
Reduction in carbon footprint (tons/lamp)		0.133833
Lighting carbon emission (tons)/year/household	6.84375	0.82125
Reduction in carbon footprint (tons)		6.0225

Why carbon footprints?

Thinking about carbon footprints is a simple way of thinking about ways to reduce environmental pollution, which is one of the main pillars of Green Productivity (GP). By reducing our carbon footprints, each one of us can contribute to making the earth a safer, better place to live.

Reduce the carbon footprint: Follow the 3Rs

There are many ways in which the carbon footprint may be reduced: eat fewer animal products; fly less often; drive fewer miles in fuel-efficient vehicles, and preferably in a car pool; buy fewer clothes; install energy-efficient equipment; and many others. Remember the 3Rs (reduce, reuse, and recycle), which are an important component of GP tools and techniques.

Case study

As an APO-certified productivity specialist and GP practitioner, I have recently completed a pilot activity retrofitting/replacing 200 conventional electromagnetic 54-W tube lights with 18-W SMD LED-based tube lights in the National Energy Conservation Center (ENERCON) (Figure). This project was a trendsetter for all other government buildings in Pakistan.

This not only has reduced energy consumption by 1000 KWh/month but also, due to increased luminosity levels, improved workplace productivity. Lighting is arguably the most vital component when measuring workplace productivity. Improper lighting can lead to eyestrain, headaches, sore necks as a result of craning, nausea, double vision, itching/burning eyes, and fatigue that can in turn lead to low employee morale and an unhealthy work environment. The total factor productivity tool under the umbrella of GP is thus also being practiced in this case.



As Pakistan's first APO-certified trainer on GP and energy efficiency, Asad Mahmood has vast experience in the field of energy, along with excellent analytical, communication, and presentation skills. He is also knowledgeable on renewable energy technologies. Mahmood is currently working with ENERCON and is a member of the Technical Committee of the World Energy Council. He has conducted more than 200 energy audits and initial energy assessments in various sectors. His energy efficiency activities resulted in reductions of about 10–15 MW of connected load.

ENERCON IS GOING GREEN... ARE YOU?

ENERCON is the first government organization that has switched to **LED tube lights and bulbs** for energy conservation. We are making all efforts to ensure that everyone else follows suit.

SIZE
The small size and low profile of LEDs allow them to be used in spaces that are too small for other light bulbs.

EFFICIENCY
LEDs give off light in a specific direction, and thus are more efficient than incandescent and fluorescent bulbs, which waste energy by emitting light in all directions.

LOWER TEMPERATURES
Conventional light bulbs waste most of their energy as heat. LEDs remain cool, save electricity and the environment.

LONG LIFE
The life of a LED is projected to be from 35,000 to 50,000 hours, compared to 750 to 2,000 hours for an incandescent bulb.

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Green Economy: Does it include you?

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Let's Green up our Environment

For further guidance please visit our website: www.enercon.gov.pk

Figure. Sample ENERCON poster.