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"STUDY OF ENERGY EFFICIENT LED LIGHTING SCHEMES CONTEXT FOR INDIA"

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Abstract: Since the industrial revolution, the power required for any function in the economy has become the most basic element. Each section of modern society, from industrial to domestic agriculture and services and government operations, is dependent on electricity. The newly industrialized countries (NICs) has increased the demand for electricity and power generation. In terms of the power sector in India currently ranks fourth in the global level. With 288,865.94 MW of installed capacity and power generation in the year 2013 with a 4.8% global share[1]. Lighting contributes the highest amount of electricity usage in India. Generally, 20% to 50% of lighting electricity consumption will be consumed. Efficient and effective use of lighting can offer major energy and cost savings. This research investigates and analyzes the energy management in a building and presents the design of energy-efficient lighting systems. The energy efficiency of LEDs has increased substantially since the first general illumination products came to market, with currently available lamps and luminaries having efficacies more than three times as high as the best products from 2005. This fact sheet for the efficacy of LED packages and full veteran's current and projected standards, as well as the discussion of providing conventional techniques.

Keywords: NIC, Energy efficiency, LED

I. INTRODUCTION

India's power sector as of the end of June 2014 was 288,865.94 MW of installed capacity (1). India, Japan and Russia, with excellent power output of 4.8% global share of electricity in 2013 became the world's third largest producer. Constitute 87.55% of the installed capacity of non-renewable power plants, and the remaining 12.45% of total installed capacity of renewable energy plants formed. India during 2013-14 fiscal year (excluding electricity generated from renewable and captive power plants) to power approximately 967 TWh (967,150.32 GWh generated). The total annual generation of electricity from all types of sources 1102.9 in 2013 terawatt hours (TWh) was.

Total Installed Power Capacities in India

Total installed capacity in MW	= 288,865.94
Thermal (a) Coal in MW	=148,478.39
(b) Gas in MW	= 22,608.85
(c) Diesel in MW	= 1200.75
Total Sub In MW	= 172,287.99
Nuclear in MW	= 4,780
Hydro in MW	= 39,375.40
Renewable in MW	= 72,422.55

In terms of fuel, coal-fired plant in South Africa, compared to 92% of India's installed power capacity accounts for 59%; 77% of China; And 76% of Australia. After coal, renewable hydropower for about 9%, 17% for renewable energy and natural gas accounts for 12%.

In December 2011, more than 300 million Indian citizens had no access to electricity. As 6% of the urban population had more than a third of India's rural population lacks electricity. In India, those who have access to electricity supply was intermittent and unreliable. In 2010, blackouts and power shedding irrigation and construction disrupted across the country. Such Gujarat, Madhya Pradesh and other states provide state as constant power supply.[1]

The per capita average annual domestic electricity consumption in India in 2009 was 96 kWh in rural areas and 288 kW was. India's per capita energy consumption of domestic agricultural and industrial estimates vary depending on the source. 400-700 kilowatt place between two sources in 2008-2009. As of January 2012, a report, a total of 778 kWh consumption per capita to be found in India.

India is currently the United States, China and Russia is the world's fourth largest energy consumer, even if the principal suffers from a lack of power generation capacity.

In 2013, 23.65% of India's network of technical losses. [3]

Demand trends

As in previous years, demand for electricity in India during 2010-11 so far, both in terms of base load energy and peak availability of availability, ineffectual. Base load requirement mu 788 355, 861 591 against the availability of a 8.5% deficit (U) was. During peak load demand of 110 GW, 122 GW against availability of a 9.8% reduction was for.

During 2011-12, India's industrial demand accounted for 38% of the electrical power required, the domestic household use 30%, agriculture 18%, 9% commercial,

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public lighting and other miscellaneous applications accounted for 7% a base load and peaking power deficit reduction accounted for the remaining 5.1% and 2% respectively. All areas in North-East India to a maximum of 17.4% is expected to face a shortage of energy .[2]

Region	**Energy**		
	Requirement (MU)	**Availability (MU)**	**(+)/(-)***
Northern	328,944	318,837	-3.1%
Western	288,062	289,029	+0.3%
Southern	298,180	260,366	-12.7%
Eastern	118,663	114,677	-3.4%
North-Eastern	14,823	12,248	-17.4%
All India	**1,048,672**	**995,157**	**-5.1%**
Region	**Peak Power**		
	Demand (MW)	**Supply (MW)**	**(+)/(-)***
Northern	47,570	46,899	-1.4%
Western	45,980	52,652	+14.5%
Southern	41,677	32,423	-22.2%
Eastern	17,608	17,782	+1.0%
North-Eastern	2,543	2,215	-12.9%
All India	**147,815**	**144,788**	**-2.0%**

***Surplus- (+) and Deficit - (-)**

II. LIGHT EMITTING DIODE(LED) LIGHTING

Usually a commercial site lighting of the total power consumption accounting for 55% to 20%, in non-domestic buildings can represent a significant proportion of energy consumption. UK non-domestic light emission of CO2 every year, according to the Carbon Trust is responsible for approximately 24 million tonnes. So while minimizing environmental impact, can yield significant cost savings in lighting energy efficiency improvements. Such LEDs, CFLs and energy-saving halogen light, as the deployment of efficient lamps Technologies cut costs by 80% compared with traditional lamp technologies are possible. Intelligent light control forward a typical office environment, typically between 30% and 50%, reducing energy consumption can be used. The energy efficiency of LED lighting as a generally basic ratio of power input to the efficacy, light output or more technical power draw characteristic use (watts) divided by the emitted flux (lumens) such a 0.1 for simple concept, however, should not be overlooked that there are several important nuances. For example, an integrated LED light, LED lamp or LED luminaries efficacy of an efficacy that is different from their own is; Differential driver, thermal, and optical loss stems from. This traditional and LED lightings, lightings and laboratory as well as the commercially available samples used to measure the difference between the different processes is also necessary to understand the law.

Full lightings LED lightings and efficacy of both spectral efficiency for the internal quantum efficiency from electrical potential which depends on many factors. Presenting varying levels of improvement in these aspects, the Dow reached such a level LED luminaries efficacy lm / W with more than 2 .Upon 200, 266 lm / W efficacy of the target LED package is installed, the LEDs so far will surpass the efficacy of current linear fluorescent, compact fluorescent, high intensity discharge (HID) and incandescent sources, all of which, with less opportunity for better performance generally considered mature technology. This fact sheet discusses mainly the best of lightings income class, it's a given source type to remember that not all products perform equally important. It's currently available is especially true for LED lightings.

(a)Absolute Versus Relative Photometry

Absolute or relative photometry of lighting systems can be measured using two different methods. Usually used with conventional lighting products relative photometry, a lamp and luminaire allows for the combination of different measurements. To determine the efficacy luminaire efficacy of the lamp can be multiplied by the luminaire efficiency. Although not without limitations, the relative lamp and luminaire photometric characteristics and consistent interaction with the small interchangeable between fixtures to lamps that are generally appropriate. Conversely, a material impact on system performance included in the package are headed. It assumes full light the absolute photometry, the measurement required.
As advances in solid-state lighting industry, various products such as LED light engine configuration, in some cases, may indicate a return to relative photometry is. At least, the advent of LED lighting has led to a reassessment of the photometric test procedures and performance data.Spectral increased awareness of the power distribution source. Therefore, within a given product family, a low-efficacy tend to be clustered with a high CRI. In principle, being a low CCT is not harmful for efficacy, but due to factors other skills currently available in cool white LED packages (eg, 6500 K), approximately 20% (eg, 3000 K), warm white LED packages there are more than impressive, as shown in Figure 2, the current trend is that the difference will be negligible finally, with the expectation that indicate decreasing. Third, the LED package can be operated in several different streams. Mother typical basic 350, but 700 mA, 1000 mA, or drive high currents are also commonly available. (In a high current, ie) hard driving LEDs, lumen output increases, but a consistent result in a reduction in efficacy; This phenomenon is known as the slope efficiency. Lack has been investigated extensively, and in the next ten years, is expected to reduce the harmful effects of slope.

In return, the variables that affect the efficacy of LED packages also contribute to the lamp and luminaire performance. However, the efficacy of the LED package, which usually do not correspond to real-world operating characteristics of a certain ambient temperature (25 ° C), but (rather than continuous operation) is determined

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using pulses of light important to note briefly 's. Moreover, such a 276 lm / W LED packages reported as more laboratory samples,, some remarkable achievements made possible by carefully selecting the chips are very good. Is not relevant for characterizing the products currently available, these measurements are useful in foreshadowing of future performance.

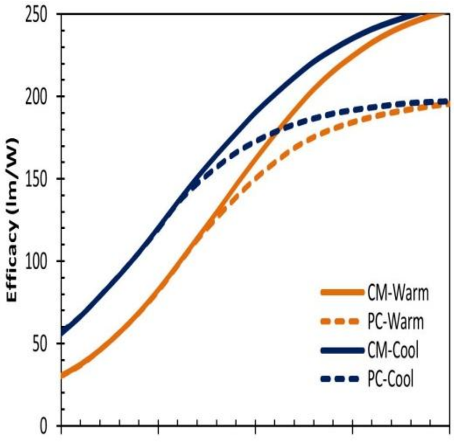

Figure 2. Color Composite (CM) and phosphor coated (PC) actual and projected increases in the efficacy of LED packages.

(b) Lamp and Luminaire Efficacy

Thermal effects, driver loss, and optical inefficiencies than the LED packages combine to reduce the efficacy of LED luminaires. Considered collectively, these loss mechanisms may decrease the efficacy of over 30%. In particular, full LED lamps and luminaires efficacy is most relevant for building energy use.

Figure 3 / two integrated LED lamps and LED luminaires February 2013 based on the fact the LED light LED lamps and luminaires listed for more than 7,000 lumen output versus efficacy, effectiveness listed approximately 120 lm / W to 10 lm at least most of the products shows ranging from 40 W and 80 lm / W were between. As expected, the measurements are perfect for lighting because currently available is much less than the efficacy of LED packages.

(c)Application Efficacy

Lamp and luminaire efficacy of important indicators of energy efficiency, but they can not tell the whole story. Efficacy is defined as the application of force, when comparing products for a specific application may provide valuable data, draw necessary to achieve the specified illuminance criteria., may provide valuable data when comparing products for a specific application. If a luminaire directs a greater percentage of light to the target area—a roadway, for example—it may have a higher application efficacy despite having a lower luminaire efficacy. Importantly, the application for all uses of a given product is not possible to quantify the effectiveness, efficacy nor the application should be compared for different situations. There may be reported as a product feature that is a normal price, so the efficacy of the application on a case-by-case basis should be calculated.

Different light sources have different emission properties can influence the efficacy of the application. Due to the directional nature of their emission, LEDs in some situations than other light sources has the potential to provide greater application efficacy. Most CFL, incandescent "light bulb," and HID lamps need a directional distribution of the emitted light should redirect a large proportion of an optical system, which means emits light in all directions. Optical systems are not fully efficient, and for the right area may not be able to give guidance to the emitted light. The optical control point sources is more difficult than the large area sources such as CFLs, is especially true for. In short, matching the right product with the right application for energy efficiency is an important consideration, and it is equal to or greater than the choice of light source technology can have an impact. Currently available LED lamps are typically about 85% efficient.

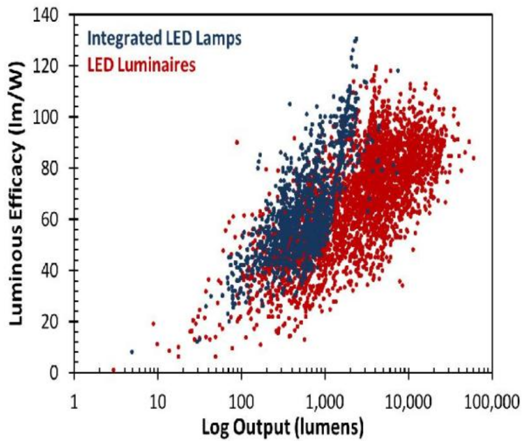

Figure 3. February 2013 as listed by the fact integrated LED light output versus LED lamps and LED luminaries efficacy.

(d)Initial and Maintained Efficacy

But, at least in theory, the input power remains constant lumen output of almost all lighting products, over time depreciates. Thus, at the beginning of life assessment luminous efficacy luminous efficacy than when life is coming to an end. Importantly, the overall amount of lumen depreciation rate of decline differs for different source types, or even using the same type of source are different products. 70% of the initial value of an LED product can be produced, whereas, for example, a high-quality T8 fluorescent lamp lumen output, 95% of the initial evaluation at the end of life can be. Thus, the more impressive is that the source may change over the life of lightings. Efficacy maintained by the manufacturers usually do not notice the lighting calculations are performed and the light energy density is evaluated, then it likely will come into play. Because standard-practice calculations are based on future performance, a source with a lower maintained efficacy may lead to greater

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energy use at the time of installation and a higher rated power density. However, this "hidden" performance may be overlooked if Only the first is used to compare the efficacy of two lightings However, if it is "hidden" display can be ignored. Along with many other ideas, brought to mainstream LEDs lumen depreciation to reduce or eliminate the concept of increasing the power draw. This procedure is used frequently today, its prevalence may increase in the future. Such luminaires may reduce over lighting and allow for a smaller connected load initially, but the efficacy will decrease over time and energy use will increase. This approach or the system's lifetime may not lead to lower energy use, and can make it more challenging than product.

(e)Efficacy versus Energy Use

Efficacy is related to energy efficiency, but it can not be used to establish energy use. Energy use is the power draw over time, and usually kilowatt hours (kWh) is reported in units of. It is operated for a short time if a less impressive product that can actually use less energy. To realize energy saving control systems can be a valuable tool.

(f)Comparison

LED and efficacy compared to conventional products, it is important to consider the whole system. Even though relative photometry focuses on lamp properties and the efficiency of the luminaries, calculating total luminaries efficacy is the best way to compare conventional products to LED products, or anything measured with absolute photometry. Still, there may be differences in performance that are not captured by relative photometry.

A basic comparison of the efficacy of several key technologies lamp shown with shaded areas shown with black boxes and typical Giants raw lamp efficacy or effectiveness with the package, is provided in Figure 4. All major types are grouped together, but in general, the efficacy of current LED products like fluorescent and HID products, partly because the variability is substantial. Figure 4 also is much higher efficacy of currently available LED packages, however, several integrated LED lamps and luminaries LED display that shows the benefits do not promote. Importantly, the LED efficacy is expected to improve significantly in the near future which showed the same kind of source.

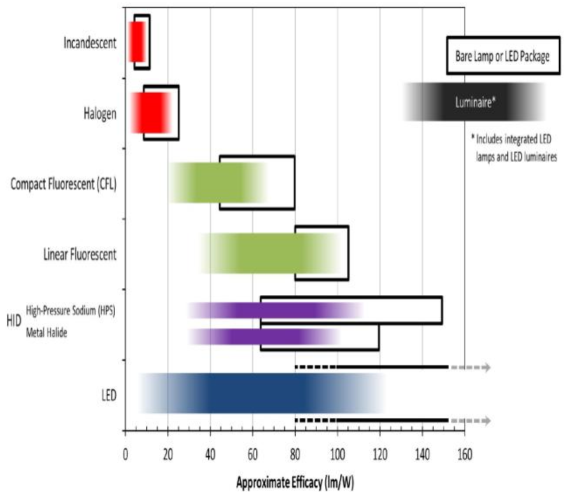

Fig. 1. Approximate range of general efficacy of various light sources, in January 2013 as a black-box construction, materials, wattage, or other factors may vary depending on the bare efficacy of traditional lamps or LED packages, show. Shaded areas driver, thermal, and optical damage the entire system including, understands the Giants efficacy, show. Listed only LED light source technologies is expected to increase significantly in the near future efficacy[4].

(g)LED vs. CFL vs. incandescent light bulb comparison chart [5]

1.Energy Efficiency & Energy Costs

Particulars	**Light Emitting Diodes (LEDs)**	**Incandescent Light Bulbs**	**Compact Fluorescents (CFLs)**
Life Span (avg.)	50,000 hours	1,200 hours	8,000 hours
Watts of electricity Used(equiv alent to 60 watt bulb)	6 - 8 watts	60 watts	13-15 watts
KW of electricity used(equiv alent to 60 watt bulb/year)	329 KWh/yr.	3285 KWh/yr.	767 KWh/yr.
Annual operating cost(equiva lent to 60 watt bulb/year)	Rs 2013.70/ year	Rs 20142.60/year	4698.70/year

2. Environmental Impact

Contains the TOXIC Mercury	No	No	Yes - Mercury is very toxic to your health and the environment
ROHS Compliant	Yes	Yes	No - contains 1mg-5mg of Mercury and is a major risk to the environment
CO_2 Emissions (30 bulbs per year)	204.754 Kgs/year	2025 Kgs/year	472.95 Kgs/year

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3.Important Facts:

Sensitivity to low temperature	None	Some	Yes - may not work under negative 10 degrees Fahrenheit or over 120 degrees Fahrenheit
Sensitivity to humidity	No	Some	Yes
On/off Cycling	No Effect	Some	Yes - can reduce lifespan drastically
Turns on instantly	Yes	Yes	No - takes time to warm up
Durability	Very Durable - LEDs can handle jarring and bumping	Not Very Durable - glass or filament can break easily	Not Very Durable - glass can break easily
Heat Emitted	3587.187 Joules/ho ur	89679.679 Joules/hour	31651.652 Joules/hour
Failure Modes	Not typical	Some	Yes - may catch on fire, smoke, or omit an odor

4.Light Output:

450 Lumens	4-5 Watts	40 Watts	9-13 Watts
800 Lumens	6-8 Watts	60 Watts	13-15 Watts
1100 Lumens	9-13 Watts	75 Watts	18-25 Watts
1600 Lumens	16-20 Watts	100 Watts	23-30 Watts
2600 Lumens	25-28 Watts	150 Watts	30-55 Watts

(h)Advantages of LED Lightings

1. LEDs generate light (lumens) per unit of power (watts) use.
2. LEDs power plants and lower electricity bills to help reduce greenhouse gas emissions.

III.METHODOLOGY

This is a real case study of an exclusive spa project in the India in which energy-efficient lighting has been used. The main reason for the selection and investigation of this case is that there are many good practices of energy-efficient lighting that can be identified and analyzed.

IV. CONCLUSION

Efficacy of LED lightings for general illumination rapidly since its beginnings as a source improved. This trend, new materials, improved manufacturing processes, and is expected to continue thanks to the new configuration. Currently, the efficacy of the LED package compares very favorably to conventional light sources, and integrated LED lamps and LED luminaries are comparable in their traditional counter parts that have efficacies. However, variability in LED products are more mature to rapidly changing technologies and products is greater. When comparing products Importantly, the efficacy should not be the only factor. Quality such as color, luminous intensity distribution, and other performance characteristics such as damnability, should be included in the overall decision. High efficacy is an important feature for energy savings; it is a space for users unperceivable.

REFERENCES

1. "All India region wise generating installed capacity of power" Central authority ministry of power, Government of India. March 2013. www.wikipedia.com.
2. Prasad Bhukya, Dr. Debasish Basak, Energy Saving Technologies in Industries- An overview, International Journal of Scientific and Research Publications, Volume 4, Issue 4, April 2014 ISSN 2250-3153.
3. ftp://ftp.fao.org/docrep/fao/010/i0139e
4. http://powermin.nic.in/
5. (http://www.designrecycleinc.com/) SSL.Fact.Sheets@pnnl.gov
6. Yoshihisa Takei," Energy Saving Lighting Efficiency Technologies". QUARTERLY REVIEW No.32 / July 2009
7. M. Yang, Closing the Gap,DOI: 10.1007/978-1-4471-4516-5_2, World Bank 2013
8. Mr. Jeremy Snyder, Advancing the effective use of light for society and environment. "Volume 2, Issue 2: How to Select Residential LED Under-cabinet Lighting".
9. Malkiat Singh, Gurpreet Singh, Harmandeep Singh, ENERGY AUDIT: A CASE STUDY TO REDUCE LIGHTING COST, 5 (2012) 119 – 122.