

विद्युत

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सहकारितामा
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आसन्न ऊर्जा संकट

निकास
स्वोर्ड ?

WLED Lighting for Rural Nepal

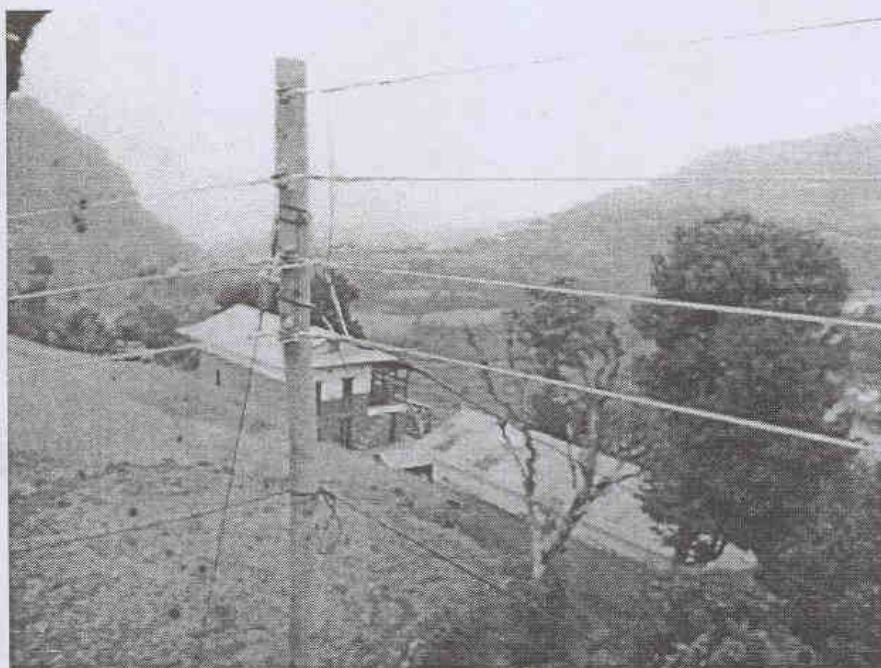
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White Light Emitting Diode (WLED) based lighting is considered to be one of the most viable lighting solutions for rural lighting in Nepal. The reasons for it can be attributed to the factors like better energy efficiency or Luminous Efficacy (more light per unit power consumed by the lamp), flexibility in luminary design, inherent compatibility particularly to solar and other battery charging systems, ease of deployment (light in weight, small in size), longer life, etc. That is why, Alternative Energy Promotion Center has large project like Karnali Ujyalo Karyakram for rural lighting in the remote western region of Nepal which will deploy massive amount of WLED based lighting.

In most of the cases of rural lighting in Nepal, Chinese WLEDs without any formal specification are considered because these are very cheap and readily available in Nepalese market. Few WLED based lamp suppliers like Pico Power Nepal uses WLED based lights manufactured using WLEDs from internationally reputed companies like Nichia, Lumileds, and Cree with formal specification, but these are expensive and difficult to acquire. Therefore, it is natural to expect that the various kinds of WLEDs have various characteristics, leading to various consequences of use.

It is important to note that rural lighting is the case of primary lighting and one must be very careful in deployment. Children are supposed to read under the WLED light for long time, and at the same time adults will be doing various tasks under the similar light. We must take care in having proper amount of light or lighting level, uniformity of light, and at the same time proper color properties of light while using the light source for primary purpose like read-



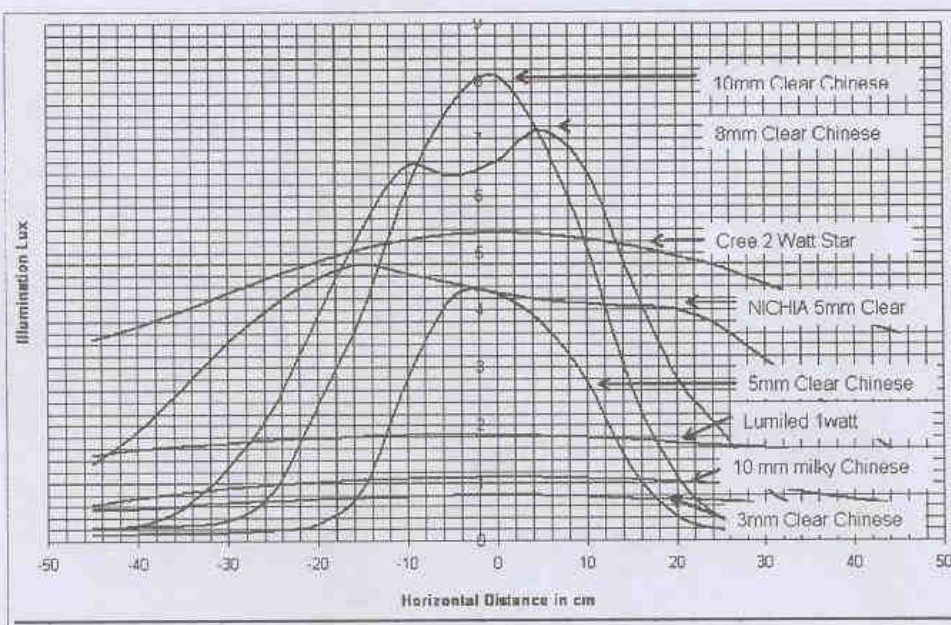
ing and doing various tasks under the artificial light.

The lighting level in a task or reading plane is normally measured in Lux (lx) and is measured using a Lux Meter. For a certain task, depending upon the fineness of task, the required lighting level may vary from 300 lx (general office task) to 3000 lx (fine surgical operations). For comfortable reading, 500 lx is generally recommended. In case of rural lighting in Nepal, this lighting level can hardly be attained and task or reading naturally is difficult to perform and tiring to eyes, which may have vision related adverse consequence in long term. Moreover, if the task is only performed occasionally, one can work in a lighting level as low as 30 lx; simple visual task may be performed comfortably at about 100 lx; comfortable reading may be done at 300 lx if the letters are large and contrast is good (for example, books of elementary school). Further, uniform lighting level is required at the task/reading plane so that it is comfortable and not adversely affecting our visual system. At Kathmandu University, we have examined the illuminance of few common WLEDs used in Nepal directly under the light at a distance of 1 meter. The illuminance distributions are presented

below which can give an idea about what to expect about lighting level and lighting uniformity under the WLED lights.

Figure 1: The Illuminance Distribution of WLEDs Investigated

In lighting quality evaluation, color properties of light are very important. The color properties of a white light source are generally defined in terms of Chromaticity or Color Temperature (CT) and Color Rendering Index (CRI). People are normally comfortable doing task under either noon-sunlight (CT about 5000 K), cool white (typical fluorescent and CFL lamps of CT about 4,000 K), warm white (incandescent lamp of CT about 3,000 K). Candle light has CT of about 1,800 K. For white light, higher CT signifies bluish light and lower CT signifies yellowish/reddish light. The CRI is a very important parameter and is more important than CT. The CRI of sunlight is taken as reference 100 and other light sources are evaluated in reference to this CRI value. The quality of light source in terms of CRI values are: 75-100 (Excellent), 60-75 (Good), 50-60 (Fair), and 0-50 (poor and not suitable for color critical applications). Incandescent bulb has CRI of 95 plus and is regarded as best artificial light, High Intensity Dis-

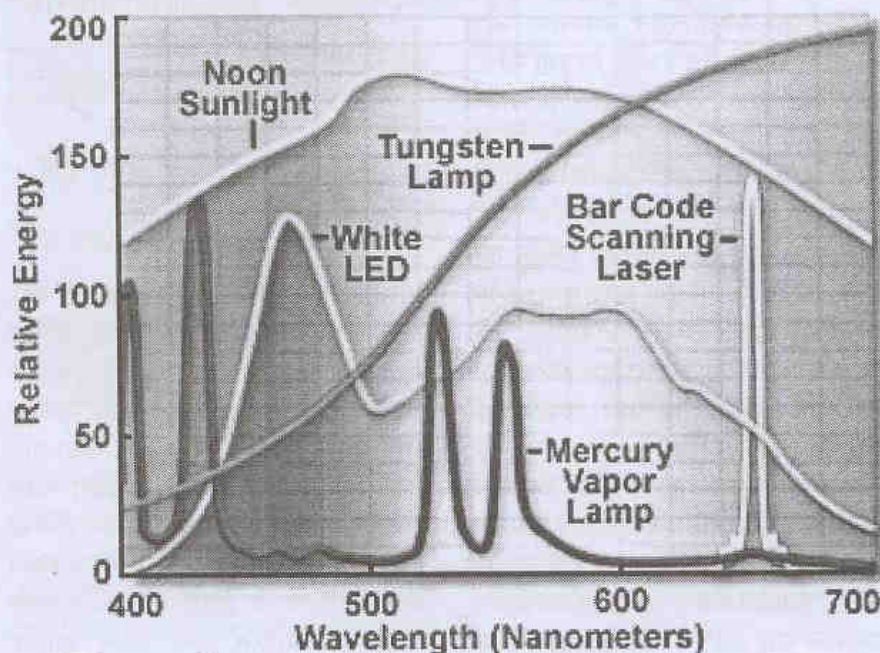


have investigated various types of available WLEDs considered for rural lighting in Nepal from the point of view of illuminance distribution and spectral power distribution or lighting quality. In case of rural lighting, as people are expected to read or perform tasks, it is very important to consider appropriate lighting level, lighting uniformity, and lighting quality so that there is very less adverse effect on vision in the long term use. Therefore, manufacturers and deployment agencies/companies need to be careful in defining and fulfilling necessary standards. This article is therefore expected to be helpful to the manufacturers, deployment agencies, and users of WLED based lighting while making selection of WLEDs, designing lamps, and meeting the standard.

charge (HID) metal halide lamp has CRI 65-90, fluorescent light (TFL or CFL) has CRI 60-90. The lowest CRI is of sodium lamp (very low about 30) and is considered very poor for color differentiating works. Therefore, CRI of 60 is a general requirement for illumination. In case of WLED, the value of CRI and CT can be very different depending on technology and manufacturer. Most of the WLEDs considered for rural lighting in Nepal are made with phosphor conversion approach and is most commonly based on a blue LED. When combined with a yellow phosphor (usually cerium-doped yttrium aluminum garnet or YAG:Ce), the light will appear white to the human eye. Therefore, depending on the quality of light and phosphor, the CRI can be different. Usually, CRI of good quality WLED is in the category of good to excellent.

At Kathmandu University, we have investigated the spectral power distribution of various kinds of WLEDs. The results are shown in Fig-

Spectra From Common Sources of Visible Light



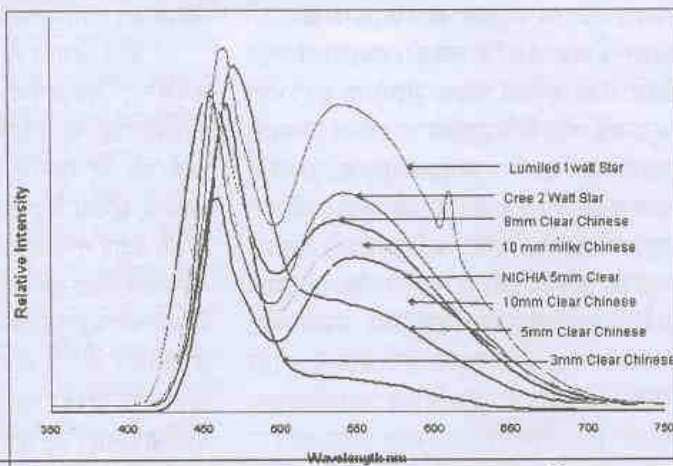
The color properties of a light source mainly depend on its spectral power distribution. The spectral power distributions of typical common light sources are indicated in Figure 2. As a human being, we are comfortable at reading and performing a task and identifying colored objects if the spectral power distribution is of the light source is closer to that of sunlight or incandescent. A good quality phosphor conversion WLED will have the spectral power distribution as shown in the same figure.

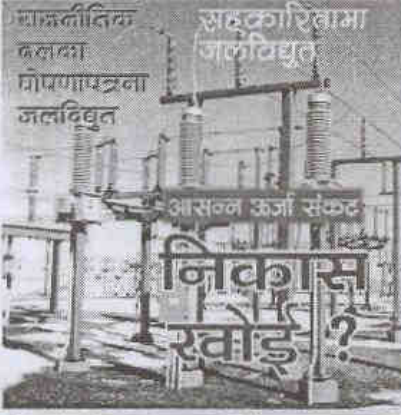
Figure 2: The Spectral Power Distribution of Common Lamps and Sunlight

ure 3. As seen in the investigation, some of the cheap WLED have quite bluish light and are not suitable for general illumination.

Figure 3: The Spectral Power Distribution of WLEDs Investigated

In conclusion, we





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संरक्षक

डिल्ली घिमिरे

सम्पादन तथा व्यवस्थापन समूह

प्रेम गिरी

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सम्पादन सहयोगी

विष्णुप्रसाद ज्ञवाली

संवाददाता

सुशील पन्त

कमर डिजाइन/ले-आउट

केदार अधिकारी (९८४९२९३०८)

छापाखाना

नेपाल प्रिन्टिड सपोर्ट

अनामनगर, काठमाडौं, सिंहदरवार

गेटअगाडि, फोन नं : ४२६५८२९

प्रकाशक

सामुदायिक विद्युत उपभोक्ता राष्ट्रिय महासंघ नेपाल

पत्राचार ठेगाना

ललितपुर उपमहानगरपालिका, वडा नं.

४, पुल्चोक (जर्को)

फोन/फ्याक्स : ५००९१५२

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संस्थागत रु. ६००-

आवरण तस्वीर : पश्चिम चेती (रतन भण्डारी)

नयाँ नेपालमा ग्रामीण विद्युतीकरण

देशमा भएका जनआन्दोलनदेखि संविधानसभाको चुनाव सम्पन्न गर्नेसम्म बिजुलीको क्षेत्रमा क्रियाशील उपभोक्ताहरूले पनि उल्लेखनीय योगदान गरेका छन्। नयाँ नेपाल निर्माणका लागि उनीहरूले खेलेको भूमिकालाई सबै राजनीतिक दलहरूले घोषणापत्रमा उल्लेख गरेको जलस्रोत, जलविद्युत र सामुदायिकीकरणसम्बन्धी कुराले सम्मान गरेको महसूस भएको छ।

परिवर्तित सन्दर्भमा जनताका थुप्रै इच्छा र आकांक्षाहरू बढेका छन् भने राजनीतिक दल र सरकारको जिम्मेवारी पनि थपिएको छ। नयाँ नेपालमा सबै नेपालीले बिजुली सेवा उपभोग गर्न पाउने आशा गरेका छन्।

के नयाँ नेपाल निर्माणको एक दशकभित्र जलस्रोतमा जनस्वामित्व स्थापित हुने गरी सबै नेपालीले बिजुली बाल्ने रहर पूरा गर्न पाउनेछन् ? यो विषयमा जनचासो बढेको देखिन्छ। संविधानसभा निर्वाचनपश्चात् जलविद्युत विकास र ग्रामीण विद्युतीकरण ठूलो मुद्दाको रूपमा स्थापित भएको छ। जनताको प्रत्यक्ष सरोकारको विषय जलस्रोत र जलविद्युतसम्बन्धमा दलहरूको कस्तो दृष्टिकोण छ, यो जनताले बुझ्न चाहेका छन्। ठूला राजनीतिक दलको घोषणापत्रलाई हेर्दा नेकपा (माओवादी) ले १० वर्षमा १० हजार मेगावाट बिजुली उत्पादन गरी सबै गाउँघरमा विद्युत वितरण गर्ने भनेको छ भने नेपाली कांग्रेसले आगामी १० वर्षभित्र विद्युत उत्पादन भन्दा १० खण्डले वृद्धि गरी कम्तीमा ५ हजार मेगावाट विद्युत उत्पादन गरिने कुरा घोषणापत्रमा उल्लेख गरेको छ। त्यस्तै अर्को ठूलो राजनीतिक दल नेकपा (एमाले) को घोषणापत्रमा जलस्रोत उपयोगमा राष्ट्रिय हितलाई ध्यानमा राखी सामुदायिक सहभागितामार्फत सबै नेपालीको पहुँचमा विद्युत सुविधा पुऱ्याउने कुरा उल्लेख छ।

स्वदेशी पुँजीको परिचालनमार्फत जनताको स्वामित्व स्थापित हुने गरी स्थानीय निकाय, उपभोक्ता समिति र निजी उद्यमीले सञ्चालन गर्ने गरी साना तथा मझौला जलविद्युत आयोजनाको विकास र विस्तार गर्ने कुरालाई ती दलका घोषणापत्रले जोड दिएका छन्। यसबाट 'नयाँ नेपाल निर्माणको आधार जलस्रोतको समुचित विकास' भन्नेमा सबै दलहरू सहमत भएकोले आगामी १० वर्षभित्र सबै नेपालीले विद्युत सुविधा पाउने कुरा अनुमान गर्न सकिन्छ।

नीतिनिर्माण जतिसुकै राम्रो भए पनि कार्यान्वयनको अभावमा जलस्रोत क्षेत्रको समुचित र सन्तुलित विकास हुन नसकिरहेको विगतको इतिहासबाट पाठ सिकेर अबको नेपालमा ग्रामीण विद्युतीकरणको नीतिनिर्माण, योजना तर्जुमा कार्यान्वयन, मूल्यांकन र निर्णय प्रक्रियामा विद्युतका उपभोक्ताहरूलाई प्रभावकारी भूमिका दिइनुपर्दछ।

दलका घोषणापत्रमा उल्लेख गरिएअनुरूप ग्रामीण विद्युत उपभोक्तालाई जलविद्युत उत्पादनमा व्यावहारिक रूपमा मालिक बन्ने व्यवस्थाको ग्यारेन्टी गरिनुपर्दछ। सबै नेपालीलाई समान अवसर उपलब्ध गराउन ग्रामीण उपभोक्ताले बिजुलीको महसुलबापत तिरेको रकम शहरका धनी र विदेशका ठूला लगानीकर्तालाई अभै धनी बनाउने वर्तमान प्रणाली तोडिनु आवश्यक छ। गाउँगाउँ र घरघरको लगानीमार्फत जलविद्युतको विकास र लाभ वितरणको व्यवस्था आजको आवश्यकता हो। यो व्यवस्थाले धनी र गरिबीचको खाडल कम गर्नेछ भन्ने राष्ट्रिय अर्थतन्त्रमा समेत उल्लेख्य योगदान पुग्नेछ। नयाँ नेपालमा बन्ने नयाँ सरकारले जलविद्युत आयोजनाको लाइसेन्स ओगटेर बस्ने प्रवृत्तिको अन्त गर्दै नेपालको जलविद्युत उत्पादनमा सामाजिक सहभागिताको व्यवस्था गर्नु, नयाँ नेपाल निर्माणका लागि कोसेढुंगा सावित हुनेछ।

नववर्ष २०६५ को उपलक्ष्यमा हामी हाका समस्त पाठक, विज्ञापनदाता

तथा सामुदायिक विद्युत राष्ट्रिय महासंघसँग सम्बद्ध सबैमा शान्ति,

समृद्धि र उज्यालो भविष्यका लागि

हार्दिक मंगलमय शुभकामना व्यक्त गर्दछौं

विद्युत खबर प्रकाशन परिवार

तथा

सामुदायिक विद्युत उपभोक्ता राष्ट्रिय महासंघ नेपाल

केन्द्रीय समिति परिवार

