POWER LOSS AND COST DUE TO OUTDOOR LAMPS, FACTORS RESPONSIBLE AND WAY FORWARD.

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Abstract
This technical paper estimates the inefficient use of energy in homes due to outdoor luminaires. It correlates the energy use with income, education, attitude, cost and energy awareness. Areas that were studied were evaluated based on these criteria. Considering the fact that generation of power is still low and there is a need to generate more to distribute to homes in Nigeria. This paper makes emphasis on the need of awareness to consumers so that the efficient use of power could mean efficient use of energy so that more consumers can be reached.

Methods used were survey and questionnaires which are distributed and analysis were drawn from the results of both the survey and questionnaire. The result shows that cost and awareness are the major consequence of energy inefficient lamps use in homes for outdoor lamps. Attitude and irregular supply also points to forgetfulness in switching off luminaires during daytime especially for those who leave home very early.

Areas with High population of well-educated and good income are found to make use of energy savers and most of the houses do not switch on outdoor lamps during daytime while areas with less number of educated and an average income do not use more of energy efficient luminaires. From the result, an average power loss of 229.555KW was recorded from 2771 houses from an average of 3986 powered luminaires.

The use of energy savers, both artificial lamps (energy saving bulbs) and Natural lamps (Sun) would save a lot of money and would ensure that adequate distribution is met and hydrocarbon emission is significantly reduced.

Keyword: luminaire, energy saver, powerloss, outdoor lamps, efficiency

Introduction
Electricity supply is the most important commodity for national development, with electric energy the people are empowered to work from the domestic level and the cottage industries, through the small scale and medium scale industry to the large scale manufacturing industry (Odior, Oyawole, & Ovuwore, 2010). The power sector is a critical infrastructure needed for the economic, industrial, technological and social development of Nigeria. Electricity consumption has become one of the indices for measuring the standard of living of a country. In Nigeria, power sector is presently being managed by the Power Holding Company of Nigeria (PHCN) as a vertically integrated utility comprising generation, transmission and distribution segments (Sunday & Richard, A Study of Implementation of Prevenive Maintenance Programme in Nigeria Power Industry Egbin Thermal Power Plant, Case Study, 2011). The current state of transmission infrastructure is that the transmission capability is below 6000MW with high non-technical loss, below 40% infrastructure coverage and low per capital of generation put at <25W (Labo, Current Status and Future Outlook of the Transmission Network, 2010).

The power situation in Nigeria is gradually improving with new power plants built to add to the existing power plant so as to boost power supply but aside generation, transmission and distribution of power, there is the need for consumers awareness on load and minimization of losses and wastage so that the little power generated can be channelled to other places without power supply. Losses are classified into two major parts: the technical and non-technical loss. While technical losses cannot be totally avoided but can be improved upon through inventions and innovations, non-technical losses which are caused by actions
external to the power system is beyond consumers control. Here, wastage or ineffective use of power supply is another major problem that could hamper the distribution of energy supply to areas in need of it (Antmann, 2009).

As at 2012, it was estimated that about 60% to 70% of the Nigerian populations do not have access to power supply (Sunday, 2012) and more so, the Availability of supply is still low though improving with the NIPP/IPP initiative which from a research work stood at an increase of 25.2%. With Availability of supply, which reflects in the per capital energy, there would be a direct link to the per capital income (Odior, Oyawole, & Ovuwore, 2010) since it is still relatively cheap for consumers (N14.23KW/h for R2 (single and 3-phase users) users in Ibadan for 2015 (NERC, 2012) in Nigeria to get power supply from the Discos than generators or other means of supply. But wastage of power by the consumers hinders development to other areas since power is still distributed in quota formula due to the high demands and the low generation capacity which still stands below 5000MW.

**Lighting and Energy Efficient Bulbs**

The major consuming energy-electricity activities in Nigerian household are cooking, lighting, and other electrical appliances (Sunday, 2012). Lighting accounts for 6% (Sunday, 2012) use of the energy supply and from this energy are not properly utilized as they are wasted due to factors bothering on education, finance, care-free behaviour and illegal connections. The need for energy efficient bulbs is required, more so, the need to be energy sensitive is very key so that there is no unnecessary powering of lamps during daytime where illumination of the sun is adequately effective.

The efficacy of a lamp is measured in Lumen/watt which talks about its efficiency (Trevor & Moira, 2009). The chart below shows the typical efficacy of the standard lamps including standard control gear losses. This allows the relative efficiency comparison of lamps to be made. For example, a 100Watts incandescent lamp produces approximately the same amount of lumens as a 20 watts fluorescent lighting lamp. Which means for an hour, 80 watts is wasted which can be distributed to other places. Also a 250watts metal halide lamp produces approximately the same amount of lumens as a 400watts mercury vapour lamp (Trevor & Moira, 2009). Fluorescent lighting provides the most efficient lighting system mounted up to the height of 4-5 meters.
Fig 1: Graph shows the comparison of energy efficiency of various lamp types (Trevor & Moira, 2009)

Also consideration on architecture design can promote natural lighting since the sun is very readily available most times in Nigeria. Natural Light is the most efficient energy saving as no cost is added other than the initial design implementation on the building (Etiosa, Mathew, Agharese, Ogbemudia, Osazee, & Ose, 2009). The science of day light involves the deliberate use of daylight to displace electric light. Large savings are possible in residential, offices and other non-residential buildings when relative amounts of daylight and artificial light are regulated by sensors and control system. Done correctly, there would be a net saving energy consumed by the building (Trevor & Moira, 2009).

Methodology:

In estimation of the losses/inefficient use of energy, the south western zone, parts of Lagos and Ibadan were chosen for this project because of wealth, population, attitude and education. The places chosen in Ibadan, Oyo State are New Bodija, Old Bodija, Apete, Apata, The Polytechnic of Ibadan, The University of Ibadan, Agbowo. One, Places like Agbowo and Apete are a mixture of literate and illiterates of almost equal percentage with students of the University of Ibadan and the Polytechnic, Ibadan respectively living in the area as well. Also, Agbowo and Apete are considered not for elite and influentials as New Bodija and old Bodija where a large percentage is educated, relatively rich and the population is not so dense in comparison to the houses. Apata is chosen because it is a new area, population gradually building up and wealth within the environ expanding.

In Lagos, the only areas considered are parts of abule-egba (White House command Area), Oke-Afa in Isolo, and Olorunsogo which is under Mushin local government area. Reasons of Education, Wealth and Population density are also considered though the first two areas are new areas rapidly gaining growth in population and development, Olorunsogo is developed in population and has educated and non-educated people living in the area. Attitude to energy use was looked at here.
The consideration of this report is on inefficient uses due to outdoor lights except in the higher institution were offices and hostels were considered. Observation was taken on outdoor lamps for hours in a day for minimum of three days and average power was taken according to minimal of one hour power supply within the studied area.

Types of lamps used in houses were recorded and the average power consumption due to lamps seen both powered and unpowered at the studied period were recorded. Average Lumen were not considered but the average power of the various lamps put together since the report is about cost, awareness, energy-saving and reduction in hydrocarbon emission.

Surveys questions were distributed and question were developed around:

1. Availability of power and the attitude to minimize energy wastage by switching off outdoor lamps.
2. Interest and awareness to energy savers and any consideration to make changes
3. Willingness to inform others about energy savers and power consumption cost.

Results:

Table 1: Table showing the Relationship between powered and unpowered outdoor luminaires

<table>
<thead>
<tr>
<th>State</th>
<th>City</th>
<th>Location</th>
<th>Total Buildings</th>
<th>Numbers of Luminaire</th>
<th>Numbers of Powered Luminaire</th>
<th>percentage difference</th>
<th>Luminaire Power (watt)</th>
<th>Power diff. (watt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OYO</td>
<td>Ibadan</td>
<td>New Bodija</td>
<td>294</td>
<td>1646</td>
<td>249</td>
<td>84.872</td>
<td>100845</td>
<td>11068</td>
</tr>
<tr>
<td></td>
<td>The Polytechnic, Ibadan</td>
<td>13</td>
<td>1322</td>
<td>424</td>
<td>67.927</td>
<td>70595</td>
<td>21121</td>
<td>70.081</td>
</tr>
<tr>
<td></td>
<td>Agbowo, Unibadan</td>
<td>512</td>
<td>1341</td>
<td>487</td>
<td>63.688</td>
<td>65620</td>
<td>37192</td>
<td>43.322</td>
</tr>
<tr>
<td></td>
<td>Apete</td>
<td>213</td>
<td>569</td>
<td>211</td>
<td>62.917</td>
<td>27843</td>
<td>13301</td>
<td>52.229</td>
</tr>
<tr>
<td></td>
<td>University of Ibadan</td>
<td>8</td>
<td>2339</td>
<td>709</td>
<td>69.688</td>
<td>116950</td>
<td>39918</td>
<td>65.867</td>
</tr>
<tr>
<td></td>
<td>Old Bodija</td>
<td>167</td>
<td>701</td>
<td>47</td>
<td>93.295</td>
<td>33648</td>
<td>810</td>
<td>97.593</td>
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<tr>
<td></td>
<td>Apata</td>
<td>81</td>
<td>194</td>
<td>35</td>
<td>81.959</td>
<td>9234</td>
<td>2362</td>
<td>74.421</td>
</tr>
<tr>
<td></td>
<td>Abule egba</td>
<td>Command, white house</td>
<td>327</td>
<td>1023</td>
<td>523</td>
<td>48.876</td>
<td>68405</td>
<td>35303</td>
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<tr>
<td></td>
<td>Isolo</td>
<td>Oke-Afa</td>
<td>478</td>
<td>1332</td>
<td>419</td>
<td>68.544</td>
<td>84076</td>
<td>25689</td>
</tr>
<tr>
<td></td>
<td>Mushin</td>
<td>Olorunsoyo and environ</td>
<td>678</td>
<td>2132</td>
<td>864</td>
<td>59.475</td>
<td>130545</td>
<td>42791</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>2771</td>
<td>12599</td>
<td>3968</td>
<td></td>
<td>707762</td>
<td>229555</td>
</tr>
</tbody>
</table>

Fig2: Average Power loss and Average estimated Luminaires due to outdoor lamps at daytime
Fig 3: Barchat shows percentage difference of power loss and average estimated luminaire.

Discussions:
From the result both from respondents and field survey, it was found that
1. Cost are one of the major reasons for not using energy savers
2. Irregular power supply leads to unnoticed powered luminaire before leaving home.
3. Education affects the use of energy savers since information as regards energy use are not well passed around including cost and environmental impact. So areas where people are less educated are prone to contribute to energy inefficiency for residential homes and shops.
4. Also lackadaisical attitude of some energy users contribute to wastage of energy especially at public offices and students in schools since they do not directly pay for it.
5. 2771 buildings were recorded for the study. Out of the total number of average estimated luminaires (noticed outdoor luminaires) of 12599 which gives a total of 707761watts, a total of 3968 luminaires were found to be energized during daylight, which gives a total average estimated power loss of 229555watts.
6. The estimated power loss was found to be 32.43% of the total number of building and luminaires studied.
7. From the result Old Bodija (2.41%) in Ibadan has the lowest energy inefficient loss while Agbowo (56.68%) has the most inefficient loss. Education, income and Cost of luminaires were seen has reasons here.
   In Lagos, Command White House(51.61%) has the highest inefficient use while Oke-Afa (30.55%) has the lowest amongst the studied vicinity in Lagos.

Conclusion and Recommendation:
From the results and discussions, it shows that the efficient use of energy has a relationship to education, income, attitude, availability of power supply. If people are well informed about consciousness to outdoor lamps at daylight and education about energy savers are given, especially the immediate and long cost savings, consumers will be more inclined to the use of energy savers to reduce inefficiency and minimize hydrocarbon emission at generating station. More so, power supply will be able to reach some parts that are in need of power since Nigeria makes use of quota systems in power distribution.
From the estimation for 2771 buildings, assuming the total of 5.17 million houses with electric power supply in Nigeria were studied, we could have a loss of 428.292MW, which could be more or less depending on the type of luminaire used, the educational level, attitude to energy use and income. It means even when all houses are powered, there is still need to minimize losses due to outdoor luminaires powered unnecessarily during daylight.
It is estimated that 23.73million households out of the 28.9 million in the country do not have access to the national electricity grid. This also could be solved by first minimizing non-technical loss due to outdoor
lamps. Energy can be distributed to household in darkness when the outdoor lamps are not unnecessarily on at daytime and when the use of energy saving bulbs are used. Also a reduction of price of lamps would also promote the use but more should be done on energy education since it would reduce wastage since energy savers have high lumens as incandescent lamps.

**Bibliography**


