

Blackout on Outdoor Light

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Abstract—The continued growth of the cities is causing an increase of the amount of surface to illuminate. However, this rise into lighting brings some unintended consequences such as increased of energy consumption or the light pollution. To make these effects less intrusive as possible some councils have chosen to perform a part-night lighting in some areas. Nonetheless, this kind of shutdown may cause serious problems which we intend to highlight in this paper.

Keywords—Energy saving, part-night lighting, switch off, vial security.

I. INTRODUCTION

THE growth of the population and the rise that are suffering the cities in the last years are causing the increased of the demand of the resources. This growth is worrying to most of the countries, which have established different objectives to achieve by 2020. Among the objectives is the reduction of the 20% of the energy consumption. To make this reduction possible is needed to adopt ways to promote a most efficient usage of the energy. Street lighting is the aspect where there is most concern to get an energy saving, because it represents up to 60 % of the energy consumption in some councils.

This high consumption is caused by the wrong lighting of the streets that cause excessive consumption and, in the most of the cases, a lighting pollution. To prevent these effects a lot of City Councils are looking for new solutions to decrease the costs of the lighting of their streets. The main problem to make the changes is that the disbursement needed to do them is highest that the economic potential of most of cities. For this reason there are many councils that have opted to reduce the energy consumption turning off the lighting of some streets. However, this solution can bring some consequences beyond energy savings.

II. PART-NIGHT LIGHTING

When the funding received from government is reduced, the City Councils must find new ways to reduce the costs. In fact, one of the highest bills of the city is the street lighting.

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For that reason, the County Councils are looking for the way to reduce the energy consumption of the lights and the easier mode is switched off some of them for part of the night. That solution is called Part-night lighting and is usual nowadays in different countries of Europe. Below is showing different examples of cities where is implemented that energy saving measure.

A. United Kingdom

The problems with energy sector and the steady increase of CO₂ footprint of the Country have led the United Kingdom government to looking for a new mode to save money and energy. Despite low energy bulbs with a low maintenance factor they don't save enough energy [1].

Different analysis of the citizen's lifestyle have discovered a fact: there are very few users on streets at night. For that reason, the Government thought that is feasible switch off the street lighting in some areas. The times when the lights will be turned off are:

- Between midnight and 5:30 am from Sunday to Thursday.
- Between 1:00 am and 6:30 am on Friday and Saturday.

There are a lot of county councils in UK which have adopted that measure of part-night lighting. Some of them are: Buckinghamshire, Devon, Dorset, Essex, Warwickshire, Gloucestershire, Leicestershire, Powys and Oxfordshire [2].

Studies made show that the benefits may to be up to 20% of the energy, turning off the lights at night. This reduction will help to save money, energy and reduce the carbon emissions as can see on the table below where appear the benefits obtained on some areas:

TABLE I
 BENEFITS OF PART-NIGHT LIGHTING [2, 3, 4]

	Lamps	Part-night lamps	Cost of lighting	Money Saved	Tonnes CO ₂ reduced
Warwick shire	49.500	80%	£ 2.200.000	£ 500.000	3.000
Derby shire	89.000	45%	£ 2.900.000	£ 550.000	2.000
Shrop shire	15.000	70%	£ 254.000	£ 115.000	600

However, not all the lights can be turned off for the security of the citizens. For that reason, the part-night lighting can't affect these areas:

- Areas neat to elderly people care homes, sheltered accommodation complexes and A&E departments.
- At pedestrian crossings
- Areas covered by permanent Local Authority/Police CCTV cameras.

- Lighting adjacent to operational taxi ranks.
- Lighting on public footpaths, alleyways and cycle paths which are located away from roads [2].

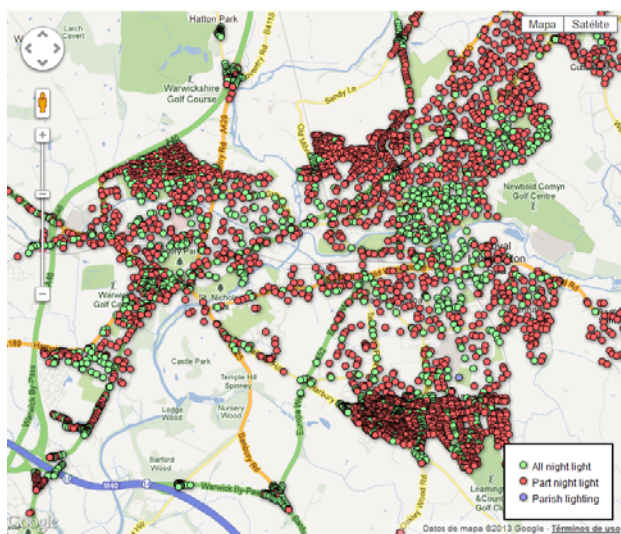


Fig. 1 Warwick part-night lighting [2]

In Derbyshire County Council was made at the end of 2011 a public consultation to know the agreement of the citizens with the measure of turned off the lights. A total of 842 responses had been received, where the 69% agreed with the proposal to switch off selected street lights. Only 31% of responders indicated that part night lighting would adversely affect them. When people were asked about the times when they go out 76% of responders indicated that they only went out after midnight once a month or less [5].

The 252 respondents who disagreed with the measure provide some comments detailing the reason why:

TABLE II
 DETAILED COMMENTS OF DISAGREED PEOPLE

Number of comments	Issue Identified
168	Potential for increase in crime and fear of crime
70	Community safety concerns - trips and falls
48	Suggestions on strategy/other energy reduction options
39	Increased night time accidents
36	Potential increase in anti-social behavior
17	Driving Safety

B. France

The government of France will launch a new measure to combat energy waste: turning off the lights of Paris. With that measure, which is going to start on July 2013, the government hopes to save two terawatt/hour of electricity a year, the equivalent to the annual consumption of 750.000 households [6]. The main idea is to reduce 20% of energy consumption for 2020. In fact, from January 2012, 304 monuments, churches, statues, fountains and bridges in Paris are being

turned off at night, including the Eiffel Tower turns off their outside lights between 01:00 and 06:00. With this measure, the energy consumed by Notre Dame Cathedral has decrease from 54.000 Watts to 9.000 Watts [7].

The capital of France is the number one on tourism destiny and is known as "the city of Light". For that reason some of the traders and merchants are unhappy with the idea, and think that measure will reduce the tourism of the city because they think nobody want to be in the dark, in the City of Light.

Most of people think that Government are cutting the fine line between sobriety and austerity, and think that is better keep working to find other environmentally friendly solutions that have less impact on our society [8].



Fig. 2 Eiffel Tower before-and-after were plunged into darkness [9]

C. Spain

In Spain there are lots of towns which are making extraordinary actions to reduce the spending. That is why many have chosen to shut down a part of the street lighting like a measure to solve the economic problems. For that reason is no unusual find areas in some towns into the darkness. Only into the Province of Madrid the switched off the lighting is extended to 12.000 of the 15.000 points of light [10].

The blackout is striking of the most of the users is being made in some of the main roads. In Madrid two of the most important highways, M-40 and M-50, aren't turning on the light at night in some areas. The Spanish Association of Manufacturers of Illumination (ANFALUM) have expressed their dissatisfaction with the measure of turning off the light on that kind of roads with a high level of traffic because they consider this can increase the mortal accidents.



Fig. 3 An access to the M-40 highway [11]

III. SECURITY RISKS

The lights that are being turned off on motorways and major roads, in town centers and residential streets, and on footpaths and cycle ways, are helping councils try to save money on energy bills and meet carbon emission targets [12]. On the other hand, we consider that switch off the lighting

may have a high price on security of the citizens. Below we will try to analyze the negative effects of that measure: the road safety and the criminality.

A. Security on Roads

The security for the drivers is strongly influenced by the visibility of the road. For that reason, the users who drive at night have more probabilities of suffer an accident. This is largely due to the reduction of the field of vision. On a road with street lighting a driver has a visual field of about 300 meters, while in the darkness is reduced to 40 meters, thereby hampering react to an unexpected obstacle like pedestrians or cyclist. This is because during night the lighting depends largely on the headlights which only allow us to see a small portion of the road ahead, but our peripheral vision is not as Sharp [13].

Despite this, statistics show a lower accident rate at night, but this is largely due to the traffic density is much lower on these hours [14]. As shown in the following image, the accident risk is highest during the night.

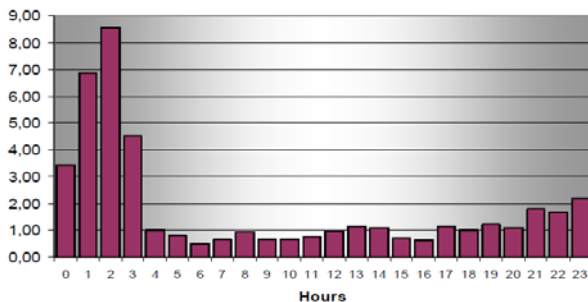


Fig. 4 Accident risk (Accident/traffic) comparing with daily average [15]

B. Crime

The innate human fear of the dark makes the feeling of insecurity suffering by the citizens about the crime increases when night come. For that reason, we think the artificial illumination after dark can be an important weapon against the burglars. This belief is based on the view that improved visibility will increase the possibilities for the identification

and the apprehension of criminals as well as provide solace to those people who fear for their safety.

Although some studies show crime reductions at nighttime relative to daylight, no solid evidence has yet been found to support the hypothesis that improved street lighting reduces reported crime.

The aim of the plan made by Mayor's Office in the City of Chicago and the Department of Streets and Sanitation in Chicago was prevent crime through improved street lighting. The study shows an increase of the reported incidents at this area before and after the changes, not the increase of the crime [16].

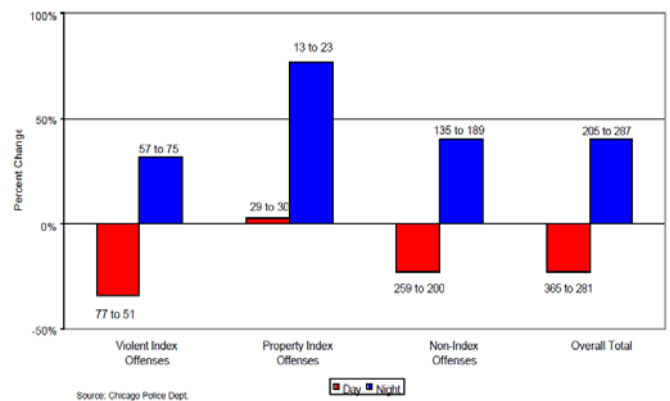


Fig. 5 Change in reported incidents in Experimental Area: six months Pre- and Post-Installation of Alley Lights Day versus Night Comparison - All Offenses

A study [17] of the Institute of Criminology of the University of Cambridge was made on Stoke-on-Trent and studies the incidence of crime on three different areas: an experimental area where they improved the lighting, the adjacent areas and the control area without changes on lighting. The study proved that crime decreased 26% at experimental area, but it increased 21% in adjacent area and 12% in the control area.

TABLE III
 CHANGES IN THE PREVALENCE OF VICTIMIZATION ON STOKE-ON-TRENT

	Experimental			Adjacent			Control		
	Before (317)	After (278)	% Change	Before (317)	After (278)	% Change	Before (317)	After (278)	% Change
Burglary	24,3	21,2	-13	20	18,2	-9	12,5	16	28
Outside theft /vandalism	20,5	12,2	-40	30,4	22,3	-27	17	16	-6
Vehicle crime	25,9	16,2	-37	18,5	11,6	-37	11,4	8,6	-25
Property crime	53	39,2	-26	52,6	40,5	-23	31,8	35,8	13
Personal crime	12,6	6,1	-52	16,3	10,7	-34	6,8	4,9	-28
All crime	57,7	42,8	-26	55,6	43,8	-21	34,1	38,3	12

IV. CONCLUSION

Despite the need of reduce the energy consumption and the light pollution to preserve the environment and save money, the shutdown of the lights is not the best solution. As we have seen this measure could have dangerous consequences for the citizens on security material.

Although the advances on lighting technology as the LED bulbs, or the capability of decrease the luminosity (and the energy consumption), there are a few councils that are deploying on their infrastructures. For that reason we think that is necessary follow studying the alternatives to improve the efficiency of the lighting without shutting the light.

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