



## **Street Lighting – Invest to Save**

### **Reduction or removal of street lighting – Interim advice note LB1**

#### **Executive Summary**

Modern street lighting provides many benefits to the community from reduced road accidents to reductions in street crime and the fear of it. Recent increases in the cost of electrical energy have caused local authorities to review their policy on the provision, operation and maintenance of street lighting to try and minimise these increases.

The initial view of the many local authorities is to reduce energy cost by switching off or operating street lighting for shorter periods. Whilst this may provide short term relief in energy cost it takes no account of the hidden increases to the community in increased calls on the emergency services and the disruption of people's life styles as well as a decrease in the use of public transport due to an increase in people's fear of walking to and from it on dark streets. The direct and indirect costs associated with switching off street lighting also need to be taken into account when making such decisions.

This advice note recognises the need to review energy costs and the provision of street lighting; however it aims to suggest alternative proposals which will keep the street lighting lit whilst helping to reduce costs. These proposals will also help reduce the impact of street lighting on the environment by reducing the discharge of greenhouse gasses and reducing the effects of light pollution.

Many of these proposals can be incorporated into existing street lighting systems whereas others can only sensibly be installed in to new or replacement street lighting. However, the sooner we start to invest in our street lighting systems the sooner we will reap the savings.



## **Street Lighting – Invest to Save**

### **Reduction or removal of street lighting – Interim advice note LB1**

#### **Background**

Following the recent and projected high increases in the cost of electrical energy a number of local authorities are looking at the potential of reducing the level or hours of operation of their street lighting systems or alternatively switching off or removing lighting completely.

Modern street lighting provides many community benefits, by

- preventing night time personal injury accidents
- reducing street crime
- reducing the fear of street crime
- promoting sustainable transport, promoting public transport, cycling and walking
- facilitating social inclusion by providing the freedom to walk along and use our streets after dark
- promoting economic development by supporting 24 hour leisure economy and distribution
- facilitate lifelong learning by providing after dark access to educational facilities
- assisting the emergency services to identify locations and carry out their duties. Without modern street lighting the time taken to attend an incident could be increased.

The effect of street lighting on the environment in the form of greenhouse gases and the increase in light pollution are often cited as reasons to switch off street lighting, however, this takes no account of the major benefits that accrue from its provision and operation. Many of our towns and cities now have a 24 hour culture which, whilst focused in the town/city centre, does not stop there but extends to the suburbs and residential areas with people travelling home after an evening out. The provision and operation of modern street lighting systems makes this possible by reducing the fear of accidents and street crime. The use of CCTV systems is only feasible at night by the provision and maintenance of modern street lighting without which it would be impossible for the Police to use this modern and effective form of observation.

## **Reducing the use of electrical energy**

There are a number of other methods of reducing the use of and thus the cost of electrical energy which should be considered before switching off or removing street lighting.

### **Photo electric cells**

Because of their low cost and reliability, photo electric cells have become the accepted means of controlling modern street lighting systems resulting in the almost universal all night operation. The actual settings of photo electric cells should be carefully considered. Currently it is almost standard to fit photo electric cells which switch on at 70 lux and off at 35 lux. These settings having been established to mimic those of time switches, to allow for the wide tolerances and inaccuracies of early photo cells and to take account of the time required for discharge lamps to reach their maximum output. Modern discharge lamps, especially those operated on electronic control gear, have a quicker run up period than older lamp types operated on conventional electro magnetic control gear and therefore reach full output quicker. The combination of these factors together with the actuality that most lighting on traffic routes averages 20 lux and on residential streets 7.5 lux allows the switching levels of photo electric cells to be reconsidered. It is estimated that if the switching levels were reduced to 35 lux on and 16 lux off that a saving of 200 hours per annum (approximately 5%) could be achieved. The 5% reduction in the operational hours of the lamp would also reduce the chances of premature failure of the lamps towards the end of their life. On an average group replacement period of four years the lamps would have operated 800 hours less (approximately two months operation) than lamps switching at 70 lux on 35 lux off. The use of lower switch on/off lighting levels is not recommended for older lamp types such as low pressure sodium lamps (SOX) and mercury vapour lamps (MBF) operated on conventional electro magnetic control gear. Such installations should be operated at 70 lux on and 35 lux off as a minimum to allow the lamps to fully run up by the time the lighting is required.

### **Reduced residential lighting**

Whilst the need for all-night lighting in our towns and cities is understandable and accepted it may not be acceptable or desirable in remote rural locations where the lighting has been provided as an amenity rather than as an accident or crime reduction feature. In such locations it may be possible to consider reducing the hours of operation by switching off when there is little need for lighting. This could be achieved by the use of electronic time switches or similar controllers, however, many people living in rural locations still like and find comfort from street lighting and the value to the emergency services is probably greater than in towns and cities. The light output of many modern lamps can be reduced (dimmed) and this may offer an acceptable alternative to switching off for part of the night. Although the capital cost of dimming equipment is high the current and projected increases in energy costs are starting to make the installation of such equipment, even in low wattage lamps used in residential areas, cost effective, especially if the environmental benefits of reduced light pollution

and the reduced carbon footprint of the lighting system are considered. It is recommended that when considering the reduction of lighting levels by dimming that the authority still complies with the requirements of the British and European Standards and reduces lighting levels by one or more lighting classes and not just by an arbitrary percentage reduction.

### **Reduced traffic route lighting**

Traffic route lighting is designed for the worst case scenario, i.e. the maximum traffic density on the road, a situation that may only occur for a short period at peak traffic flow times. The ability to reduce lighting levels by the use of electronic control gear and a suitable switching arrangement is now becoming cost effective. For instance a 150w SON/T lamp operating at full light output has a nominal charge wattage of 172 watts. If the lamp was operated at 50% of its maximum light output the nominal charge wattage would be approximately 102 watts or 60% of the full output energy consumption. This would result in a saving of 70 watts of electrical energy each hour of reduced operation. If the lamp was operated at this reduced output for 50% of the annual operating hours (approximately midnight to dawn) there would be a saving of £11 per annum on energy based on energy at 8 pence per kWh. However, many traffic routes have high peak hour traffic for a very short period with substantially lower traffic flows for the remainder of the night. In such cases a close examination of the traffic flow patterns may result in a greater period of operation at the reduced lighting level, further increasing the savings in energy use and cost. As energy costs increase so these saving will increase. It is recommended that when considering the use of variable lighting levels the authority should still comply with the requirements of the British and European Standards and reduce lighting levels by one or more lighting classes and not just by an arbitrary percentage reduction. Further advice on the application of variable lighting levels is given in the Institution of Lighting Engineers Technical Report No. 27 Code of Practice for Variable Lighting Levels for Highways. The reduction of lighting levels by switching off alternative lamps or a random number of lamps in a road is not recommended as this will result in dark areas which will give a feeling of unease to pedestrians and may hide obstacle to a motorist. The quality values (uniformity and Threshold Increment) of the reduced lighting should be the same or better than those of the undimmed lighting system.

### **Lighting class**

The British and European Standards for road lighting published in November 2003 give far greater scope for the choice of lighting class to be applied to traffic routes and residential roads than previous editions. Careful consideration of the type, use and location of the road may allow a lower lighting class to be provided than was formerly used. Lighting policies should be reviewed and reconsidered to take account of these dispensations and the lighting classes should not just be chosen to replicate or be as close to the previously used classes without considering all the requirements of the British and European Standards.

### **“White Light”**

The British Standard recommends that all new street lighting should be provided by lamps that have a colour rendering index (Ra) greater than 20, i.e. low pressure sodium lamps which do not have any colour rendering properties (Ra = 0) are no longer recommended. The use of “white light” sources (lamps with a colour rendering index greater than 60) allows a lower lighting class to be used on residential roads bringing potential savings in energy consumption, reductions in light pollution and increased amenity due to the better colour rendering of the lighting (up to 40% saving).

### **Conversions**

Modern luminaires equipped with modern lamps, control gear and optical systems can be far more efficient in terms of placing light where it is required than the older low pressure sodium and mercury vapour lamps and luminaires. It is recommended that when replacing or refurbishing existing lighting systems that the benefits of the modern luminaires and lamps are reviewed and that any replacement lighting systems are designed to maximise the benefits available. Many authorities’ replace individual low pressure sodium or mercury vapour luminaires on failure with modern high pressure sodium luminaires; however, when doing so care should be taken to ensure that the overall lighting system is not compromised by this mismatch of equipment which could be detrimental to the motorists.

Many existing lighting systems use high pressure sodium lamps (SON) operated on conventional electro magnetic control gear. The simple conversion, where possible, of these units to full electronic control gear will give an energy saving of approximately 5% whilst increasing the life and reliability of the lamp. It is recommended that as existing high pressure sodium luminaires or control gear fails that it is replaced with electronic control (dimable will provide 35% more energy saving) gear.

Many illuminated traffic signs and illuminated traffic bollards are lit 24 hours per day. The introduction of small reliable fully electronic photo cells now provides a simple and economic means of switching these units so they are only illuminated at the same times or similar times to the street lighting. The use of high reflective signs should be considered as an alternative to illuminated signs where legally permitted.

### **Environmental considerations**

Each of the above proposals has been based on the reduction in the use of electrical energy by reduced operating hours, reduced lighting levels or a combination of both. As well as reducing the consumption of electrical energy these measures will also provide reductions in light pollution. The simple switching off of a street light or reduction of its light output for a defined period of time will obviously reduce the level of light pollution during that period; however, it will not reduce the level of light pollution at times of full operation. The use of modern light sources in high performance optics can show reductions in energy consumption as well as reductions in light

pollution if the lighting class is carefully chosen to reflect the use and location of the road whilst still maintaining the amenity provided by the lighting system.

## **Switching off or removing street lighting**

It is simple and quick to switch off a street light by removing the main service fuse in the cutout at the base of the lighting column. However, care needs to be taken when doing so and consideration should be given to the damage that will occur to the electrical equipment due to non use. Following the mass switch off of lighting equipment during the 1970's and 1980's industrial disputes many authorities reported that they had to replace ballasts, ignitors, photo cells, time switches and capacitors due to the ingress of moisture. In many instances the cost of repairs was significantly higher than the savings in energy. There is also a serious road safety issue if unlit columns are left in the highway as obstructions.

### **Electrical safety**

Many Distribution Network Operators (DNO's) are concerned at the safety implications and the possible risk to the security of their network cause by street lamps being switched off and left inoperable for long periods of time. It is understood that some may require the owners of such equipment to have the electrical service removed and made safe. The cost of this work would be rechargeable to the authority and should be taken in to account when determining the cost benefits of switching off street lighting.

### **Electricity charges**

The unit cost of street lighting electrical energy is an average of the cost of the energy over the whole night and takes account of high peak costs as well as low costs during the early hours of the morning. If the consumption of energy pattern is significantly altered i.e. by operating street lighting for only part of the night then it is possible that the energy suppliers may wish to adjust the unit cost of energy to reflect this different pattern of use. This could have implications on the level of savings that can be achieved and should be taken in to account when calculating the financial benefit of switching off street lighting.

Part of the cost of electrical energy consists of charges for the use of the distribution system (DUOS) and the use of the transmission system (TUOS) and is paid to the DNO and the Grid for the provision and operation of their systems. If the service cable is not disconnected and removed the energy supplier is justified in making a charge to cover these charges and to pay this to the DNO and the Grid for the provision and maintenance of their network. These charges can add up to a considerable proportion of the unit cost of energy (up to 40%) and should be taken account of when calculating the financial benefit of switching off street lighting.

### **Dangers from unlit equipment**

Unlit lighting columns on the side of a highway will still need to be regularly inspected to ensure their structural safety and electrical safety if the service cable is retained in the lighting column. Such equipment will quickly deteriorate and become eyesores without maintenance and may well become structurally unsafe. The authority has a duty to ensure the safety of the highway and this includes any equipment they place on the highway. The Electricity at Work Regulations imposes a duty on owners and operators of electrical apparatus to ensure its safety. This duty includes the safety of street lighting equipment. The ongoing costs of maintaining the structural and electrical safety of the apparatus should be taken in to account when calculating the financial benefit of switching off street lighting.

A Highway Authority has a duty to maintain the safety of the highway and the equipment thereon and may be liable for an accidents arising from its failure to take reasonable steps to prevent objects it has placed in and around the highway (e.g. road signs, lighting columns, etc.) from becoming a danger to the public. An obvious way of warning of this danger at night is by keeping the apparatus lit. With the increase in litigation Highway Authorities should make allowances for and take account of a potential increase in third party claims following the switching off of street lighting.

### **Alternatives**

The use of Intelligent Road Studs (IRS) and the upgrading of white lines and signing may be a practicable alternative to road lighting on traffic routes, especially those in some rural locations. Such alternatives whilst providing guidance and safety for motorists do not give security to pedestrians and cyclists and should only be used where there are little or no pedestrians and cyclists. The capital costs and ongoing costs of maintaining the intelligent road studs, white lines and enhanced signage should be taken in to account when calculating the financial benefit of switching off street lighting

### **Speed limits**

Where street lighting is removed, especially on rural roads, it is possible that any speed limit applicable due to the street lighting may have to be reapplied by a traffic regulation order and the provision of signing, the cost of which should be taken account of when making the decision to remove the street lighting.

### **Permanent removal**

It is however possible that that there are a number of locations where Road Lighting could be removed or reduced for instance:-

- A road with little or no adjacent properties that have been by-passed or the level of traffic has been substantially reduced by other means. When building a new by-pass the Highway Authority should review the role of the by-passed road and the extent and type of lighting on it to determine if removal or a reduction in level or extent or type of lighting is possible.

- An isolated lighting point installed to serve a social need that is no longer there i.e. a single light adjacent to a bus stop, telephone box or other community amenity that has been removed, or a single light adjacent to a village hall or other communal building that is no longer used as such.
- Residential or industrial roads that no longer serve this purpose, i.e. the housing or commercial premises have been demolished.
- Roads where it can be demonstrated that the lighting no longer serves a purpose i.e. a road to a public facility that has been closed or is no longer used by the public.

There would be a need to consider the social needs and consult with the remaining residents, adjacent property owners and road users; however, it may be possible to demonstrate by comparison with other similar unlit roads that there are no major reasons for retaining the street lighting system. Never the less care should be taken to ensure that the removal of a lighting system will not seriously impair the safety of the highway and its users and that the reason for which the lighting was installed is no longer applicable. Highway Authority's should always review the ongoing requirement or need for street lighting before replacement. The class of lighting to be provided should also be reviewed in accordance with the British and European Standards. The automatic replacement of a lighting system to the same standard or a higher standard should be only take place where it can be demonstrated as necessary by application of the processes in the British and European Standards.

Other considerations that a Highway Authority may wish to take account of whilst reviewing the removal or reduction of lighting installations includes:

- Private Lighting installed on private property which the authority is maintaining by default or for historical reasons.
- Footway Lighting installed on public highways which the authority is maintaining i.e. lighting that should be maintained at the expense of the Lighting Authority.
- The de-illumination of illuminated traffic signs and illuminated traffic bollards.

## **Powers and Duties**

When reviewing the provision, maintenance and operation of street lighting systems an authority should take account of the following items:-

- A Highway Authority has a power, not a duty, under the Highways Act 1980 to provide and maintain Road Lighting. Similarly, the local Lighting Authority, usually the Parish, Town, District or Borough Council have the power to provide and maintain Footway Lighting.
- In exercising its powers with regard to the extent, operation and maintenance of its Road Lighting, a Highway Authority should act reasonably. If it acts in a way that no reasonable authority would act,



then the decision of that authority could be subject to review in the Courts.

- Road lighting has many community benefits – e.g. the prevention of night time road accidents, the reduction of street crime and the fear of crime. In exercising the Highways Act powers, the Highway Authority is required under s.17 of the Crime and Disorder Act 1998 to have regard to the effect on crime and disorder in the exercise of those powers and to have regard to the need to do all it reasonably can to prevent crime and disorder. However, there is no overriding duty on a local authority to provide or keep lit systems of street lighting to prevent crime.
- Unless provided by separate order, restricted roads and their associated 30mph speed limits are established by the presence of a “system of lighting furnished by means of lamps placed not more than 200 yards apart”. (s81 and 82 of the Road Traffic Regulation Act 1984).
- Whilst Road Lighting has several community benefits there is no overriding duty on local authorities to keep lit systems of Road Lighting that it owns and operates to prevent crime.
- A Highway Authority is not liable for accidents arising from a failure to light a highway unless the accident arises because the authority has failed to take reasonable steps to prevent objects it has placed in and around the highway (e.g. road signs, lighting columns, bus shelters etc.) from becoming a danger to the public. Lighting is an obvious way of warning of this danger at night.
- A Highway Authority would be negligent if an accident was caused directly by its Road Lighting apparatus being in such a state of disrepair that it caused an injury e.g. a badly maintained lighting column collapsing due to fatigue and falling onto someone passing by, or a person receiving an electric shock or being electrocuted due to faulty electrical equipment.
- A Highway Authority may be challenged if it removed a system of Road Lighting or failed to maintain one in operation if it cannot demonstrate that the reason the system of Road Lighting was installed for was no longer applicable i.e. if a system of Road Lighting was installed as an accident remedial measure and the level of night time accidents increased following its removal or a system of lighting was installed as a crime reduction initiative and crime increased following the removal or downgrading of the lighting system.

## Conclusions

There are many ways in which the use and thus the cost of electrical energy for street lighting can be reduced; however, these will generally require the authority to “Invest to Save”.

It is recognised that the cost of converting lighting to part night lighting is less than fitting variable level (dimming) control gear, however, the benefits of lighting are lost when the lights are switched off whereas if the lighting is

reduced to a lower level it will still provide illumination giving security and safety to all road users particularly pedestrians and cyclists.

The careful choice of lamp type and lighting class can also provide lower energy consumption further reducing costs. It is recommended that each Highway Authority review its lighting policies in accordance with the procedures specified in the British and European Standards to determine the correct level of illumination for different road types, use and location and that the minimum lighting level that meets these requirements be provided. When reviewing their lighting policies authorities should take care not to just to replicate or provided a lighting class to the same levels and quality as previously used classes without carefully considering all the requirements of the British and European Standards

It is recommended that when replacing existing high pressure sodium control gear or luminaires on failure that the opportunity be taken to replace it with full electronic control gear.

It is recommended that all illuminated traffic signs and illuminated traffic bollards be illuminated only at night and that existing units that operate 24 hours per day be converted to photo electric cell as soon as possible.

It is considered that the many benefits street lighting provides the community far outweigh the limited returns that can be achieved by switching off or removing lighting. However, there are a number of potential situations where the removal of lighting can be demonstrated as a safe and practical procedure. When applying these principles the authority should ensure that there is no longer a need for the lighting and that any adjacent property holders have been consulted. Where the provision of street lighting has established a speed limit care should be taken to ensure that a speed limit is applied by order when the lighting is removed.

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