

ANGUS COUNCIL

INFRASTRUCTURE SERVICES COMMITTEE

3 MARCH 2009

REDUCING THE ENERGY CONSUMPTION OF STREET LIGHTING

REPORT BY THE DIRECTOR OF INFRASTRUCTURE SERVICES

ABSTRACT

This report outlines the council's options for dealing with the desire to reduce electricity consumption of street lighting both in terms of reducing the corporate carbon footprint and to mitigate the significant recent increases in energy costs, and recommends trialling of dimming.

1 RECOMMENDATION

1.1 It is recommended that the committee agree to:

- i) note the ongoing pressures to reduce electricity cost and the council's carbon footprint specifically in relation to street lighting;
- ii) note the proposals and authorise the Head of Roads to trial dimming of street lighting in certain locations to conserve energy as set out in this report;
- iii) not to pursue the other options which are identified in this report, including switching off street lights, at this time.

2 BACKGROUND

2.1 The significant rise in street lighting energy costs has previously been reported to this committee (Report 1148/08 25 November 2008), with the increases having a significant impact on the Roads Division's revenue budget. At current prices it costs £47 per annum for electricity for each of the council's street lighting columns which number in excess of 20,500 columns.

2.2 In addition there is an ongoing desire and effort to reduce the carbon footprint of council services.

2.3 There have been numerous recent reports in the media regarding local authorities (mainly in England and Wales) reducing the time of operation of street lighting either completely or at certain periods of the night. The main rationale behind these schemes has been to save both energy consumption and the associated costs. Public reaction and media response to these schemes has, in most cases, been less than positive. In one area, Powys, a review of an initiative resulted in lights being switched back on.

2.4 Research on the issue is mixed. Street lighting in general is provided for public safety, aiding vehicular and pedestrian traffic in particular, it also has an influence on crime prevention and on the fear of crime. Recently published research suggests that street lighting has reduced the number of fatal crashes by up to 77% and other collisions by up to between 32% and 55% in certain areas, but noted that further studies were needed to confirm the validity of the work generally.

- 2.5 Reducing electricity consumption is an ongoing objective within the street lighting professional community. The UK Lighting Board produced a document in August 2006 "Street Lighting- Invest to Save" which explored proposals for reduction or removal of street lighting. This committee report explores the options available to the council. The Institution of Lighting Engineers (ILE) continues to make representation on this issue and as recently as October 2008 released a related press article. This article noted that exterior public lighting is a relatively small part (0.6%) of the UK carbon footprint.

3 DETAILS

- 3.1 From the outset it should be noted that the reduction in operational usage of a street light is not directly proportional to the electricity cost. A 10% reduction in the times that lights are on, does not result in a 10% reduction in costs. Electricity used by street lighting is charged by hours of use and wattage but also recognises the time of day use. Electricity used in the early hours of a morning is relatively cheaper than electricity used during the early evening. Street lighting in the winter uses both. There are also standing charges applied for the provision of the energy supply. Therefore in calculations of cost reductions a say 10% reduction in electricity usage generally results in approximately a 6% reduction in costs.
- 3.2 The possible electricity cost reduction in revenue has to be considered against the initial (capital) costs of installing/replacing new controls within the existing lighting stock. To fit controls to street lights retrospectively can be costly and the pay back times for the revenue cost reductions to recover the initial capital outlay can be lengthy.
- 3.3 The options for reducing the electricity consumption and hence costs to the council which are considered in this report are:
- Photo Electric Cells
 - Dimming
 - Use of white light
 - Turning off whole areas during some of the hours of darkness
 - Turning off alternative lights
 - Use of Light emitting diodes (LED) lighting
- 3.4 Taking each option in turn:
- 3.5 Photo Electric Cells: The sensitivity of cells may be changed so that lights switch on/off at lower light levels and therefore reduce the time of operation. The cells are factory set and to make retrospective changes requires new cells. This type of switching is only feasible in certain types of light fitting and many of the lights in Angus are unsuitable.
- 3.6 For existing installations the possible future reduction in energy revenue costs is significantly lower than the capital cost of retrospectively fitting new photocells to the existing lights and the pay back period for such investment is likely to be several decades. It is therefore not recommended that the existing lights be so adapted.
- 3.7 As photo electric cells react to prevailing light conditions, as opposed to clock systems with set times, there are difficulties in establishing actual electricity usage due to the supplies being unmetered. Therefore it is unlikely any costs savings would materialise from their installation.

- 3.8 Dimming the level of lighting by 50% between the hours of midnight and 6am is estimated to save 25% of electricity costs for those lights which are dimmed. Dimming between the hours of midnight and 6am to a level of 50% of normal lighting would save an estimated average of £12 per lantern per year in electricity costs.
- 3.9 It must be stressed, however, that dimmed levels must remain within British Standard requirements for each different classification of road. At this time dimming is not considered to be suitable for main roads, distributor roads or town centres.
- 3.10 It is considered that industrial estates and housing developments, with little or no traffic or pedestrian movement between the hours of midnight and 6am offer the best opportunity to trial such technology. This would allow a review of the performance, reliability energy reductions and cost savings which are suggested by control gear manufacturers to be ratified while gauging public perception of the schemes through appropriate consultation.
- 3.11 The cost of fitting dimming control gear is in the region of £30 per lantern for the most basic unit when fitted into a new lantern in factory situations. Recently installed lanterns (fitted in the last two – three years with electronic control gear) can be retrofitted at a cost of approximately £90 per lantern. Older lanterns with non electronic control gear are not suitable for retrofit.
- 3.12 As the provision of lighting in new housing developments is generally the responsibility of the developer it is proposed to introduce the requirement for dimming to be included as the normal specification for lanterns for developers seeking adoption of the lighting schemes by Angus council for future maintenance. This will allow the council to monitor performance and public perception in a limited number of installations at no initial capital cost to the council. Such developments however are additional burdens and therefore attract further revenue costs, albeit reduced by these proposals.
- 3.13 In addition it is recommended that this methodology is trialled in forthcoming replacement schemes undertaken by the council. The pay back period is estimated to be two and half years. Depending on the outcome of such trials and the financial costs of fitting the equipment further reports will be brought forward on possible retrofitting of such equipment to existing lights, noting the current estimated costs have a pay back period of seven and half years where retrofitted to existing installations. Appendix 1 details locations of proposed trial schemes and indicative financial implications.
- 3.14 White Light/Conversions: White light is already installed in replacement and new developments lighting schemes. The results of providing white light are considered beneficial, giving a better light level/service at reduced wattage compared to previous sodium lighting. Changing to white light is an opportunity to “spend to save” however at current budget levels it will be decades before the existing lighting stock is fully converted. Nevertheless it is recommended that white lighting be used where appropriate in all new and replacement schemes.
- 3.15 Turning off whole areas: It is theoretically feasible to turn off whole sections of lighting. Most lighting in Angus is controlled by timers through control cabinets serving a series of lights. Normally, this comes on at a preset time, set on an electronic calendar, and turn off the next morning. To switch off part way through the night and switch on again in the morning can be achieved through replacement

timers which could switch on/off twice per night requiring at an initial capital cost to install new control clocks.

- 3.16 It would be necessary to give careful consideration to which areas would be suitable for this service level reduction. Main routes for pedestrians or traffic would not be appropriate, even in the early morning, but areas such as industrial estates or selected residential areas may be more appropriate new control clocks.
- 3.17 There may be concerns over site security from the businesses involved; or general concern by residents. The proposals may well conflict with the council's community plan, to encourage new businesses, as new businesses may see such a move against their interest.
- 3.18 In industrial areas, lights could be switched off possibly for up to nine out of the current 15 hours used in the winter (i.e. say from 9.00pm to 6.00am) – and not be on at all in the summer. Average reduction in electricity usage would be as high as 80% per column. The possible savings in residential areas is significantly less, assuming a switch off between the hours of midnight and 6.00 a.m. with lights being on part of the night in the summer.
- 3.19 There is a further risk that repair costs may increase as under use of the light may result in moisture entering the components and the four month switch off over the summer may result in higher faults when the lights are used in the autumn. Making an allowance for this possible increase in maintenance, installing such equipment is estimated to give a two year pay back in industrial areas. Retro-fitting say 100 columns in an industrial area would yield £1,800 per annum cost reduction and a commensurate reduction in the electrical power consumed
- 3.20 This proposal is not supported by ILE or professional staff as it reduces the street lighting service. The power and cost reductions are relatively modest and the number of suitable industrial areas is limited. If the council was minded to consider pursuing such an option, it is suggested that the council's own campus at Orchardbank would be a suitable trial site and would set out a clear principle in the council's stance on this issue. In doing so the council may also need to consider its policy on illuminating its public buildings, statues etc and the recent capital investment made in this regard. It is recommended that should the council elect to pursue this option that further consideration be given to the ramifications and that appropriate consultation be undertaken.
- 3.21 Turning off alternative lamps: Instead of turning off areas wholesale, it is feasible to switch off individual street lights for set periods (i.e. say from midnight to 6.00 am). In Angus this would require substantial capital investment to introduce such switching gear into the individual columns as this functionality does not exist at present. This process would take some considerable capital cost, and not all lights/areas would be suitable.
- 3.22 The remaining alternatively lit columns would not provide lighting appropriate to comply with the current British Standard.
- 3.23 Many columns with older equipment could not be fitted with the required switching equipment. For those that could be the estimated pay back period is calculated as approximately 12 years due to the need to fit each individual light to be switched, based on current capital and revenue costs.

- 3.24 Installing such equipment in new/replacement lighting schemes is more economical, but reductions in electricity cost would be relatively minor.
- 3.25 This proposal is not supported by professional staff as it reduces the street lighting service and fails to provide the necessarily uniform lighting coverage. The council would need to produce a robust policy if it were to take this proposal forward.
- 3.26 Light emitting diodes (LED) lamps - LED lamps have the potential to offer significant reductions in energy consumption. At the current time the technology has not yet developed to a point whereby there are suitable LED lamps capable of providing street lighting at cost effective prices (in capital terms). Advances in technology will be monitored and any opportunity to provide cost effective lighting using LED lighting will be pursued at that time.
- 3.27 In addition to the above possibilities, the council are sometimes criticised for “daylight burning” of street lighting. On occasions it is necessary to temporarily make electrical connections to dark lights to bring them back into service, resulting in them being illuminated continuously. Usually these repairs are short term measures. However in areas of Angus, particularly where street lighting is served by older style electricity cables known as 5th core cables, such over-riding repairs are sometimes necessary on an indefinite basis until the cabling can be replaced.
- 3.28 Fifth core supplies can be particularly problematic when faults arise in the cable due to age, and in order to provide night time lighting a higher current is allowed to pass through the cables in order to locate the cable fault, requiring the control clocks to be bypassed as they can not accommodate this increased current. Consequently the lights are illuminated at all times until the cable fault is located.
- 3.29 The costs of replacing the cables, normally requiring excavation of the footway between lights and new electrical connections is disproportionately high. The costs of the continuous illumination are not reflected in the electricity charge for the unmetered supply albeit that the energy continues to be consumed in such circumstances. Given the age of the lighting in such areas, it is often more economic to bring forward a replacement lighting scheme, but this is subject to budget pressures and other priorities
- 3.30 However replacing the cabling, and the lighting columns, especially in conjunction with changing to white lighting, is an opportunity to “spend to save” if additional capital funding could be prioritised.

4 FINANCIAL IMPLICATIONS

- 4.1 The costs of fitting a dimming control to a new lighting column is in the region of £30. The average cost and placement of a replacement lighting column is in the region of £1,300. The incremental cost of fitting dimming controls to new columns is, therefore, relatively marginal. The capital costs of trialling dimming will be contained within the street lighting budgets for replacement schemes. For new developments receiving consent in the future, the initial capital costs will be met through the developer. White light is already funded through the same mechanism.
- 4.2 The revenue costs reductions from such trials are expected to be nominal at this time noting that new developments place additional burdens on the existing budget. However the trialling proposed may provide useful intelligence to better inform more significant decisions on the potential for the reduction of electrical power and the mitigation of increasing energy costs into the future.

5 HUMAN RIGHTS IMPLICATIONS

5.1 There are no human rights implications arising from this report

6. EQUALITIES IMPLICATIONS

6.1 The issues dealt with in this Report have been the subject of consideration from an equalities perspective (as required by legislation). An equalities impact assessment is not required.

7 SINGLE OUTCOME AGREEMENT

7.1 Maintaining the existing transport infrastructure is essential for National Outcome 1 (Sustainable business growth) and well maintained modern street lights reduce accidents; crime; and fear of crime thereby contributing to National Outcome 8 (Communities in Angus are safe, secure and vibrant). Switching off lights completely or switching off alternative lights may have a detrimental effect on this outcome.

8 CONSULTATION

8.1 The Chief Executive, Director of Corporate Services, Director of Neighbourhood Services, Head of Finance, Head of Law and Administration, Director of Neighbourhood Services and the Chief Constable of Tayside Police, have been consulted in the preparation of this report.

9 CONCLUSION

9.1 This report examines the options available to the council to reduce the electricity consumption of street lights thereby contributing to the council's approach to addressing the corporate carbon footprint and mitigating energy costs, and recommends trialling the use of dimming in new developments and certain replacement lighting schemes.

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NOTE:

The following background papers, as defined by Section 50D of the Local Government (Scotland) Act 1973 (other than any containing confidential or exempt information), were relied on to any material extent in preparing this Report:-

Report 1148/08 Electricity Costs Associated With Street Lighting Etc 2008/09 - 25 November 2008

"Street Lighting- Invest to Save" UK Lighting Board August 2006

APPENDIX 1

Proposed trial sites for Dimming of Street Lights

Project	Estimated Capital Costs £	Estimated Revenue savings £ p.a.	Estimated CO ₂ savings kg p.a.
Afflick Gardens, Monikie	30,330	132	380
East High St, Forfar (cul-de-sac)	15,150	60	173
Kinloch St, Carnoustie	25,450	180	519
Lomond Drive Area, Carnoustie	25,450	180	519
Dronley Road, Birkhill	25,450	180	519
Hillhead Terrace, Kirriemuir	20,360	144	415
Easterbank, Lour Rd & Rosebank Lane, Forfar	76,050	420	1211
Eastgate, Friockheim	15,270	108	311
Clova Road, Kirriemuir	25,450	180	519
Solway Gardens Area & The Fairway Area, Monifieth	81,380	552	1592
Hanick Terrace, Forfar	20,360	144	415
Back Braes, Brechin	10,180	72	208
Gagiebank, Wellbank	25,450	180	519
Highfield Place, Birkhill	25,450	180	519
Duncan Avenue, Arbroath	30,540	216	623
Victoria Street & Middlegate, Friockheim	30,450	180	519
Liff Park, Liff	25,450	180	519
Bunkerhill Crescent, Kingsmuir	20,360	144	415
Hospitalfield Area, Arbroath	50,900	360	1038
Alveston Gardens, Arbroath	30,450	180	519
Bankhead Crescent/Road, Arbroath	30,750	300	865
Rosemount, Forfar	10,180	72	208
Braehead Drive, Carnoustie	35,600	240	692
Guthrie Street, Letham	15,300	120	346
Lantern Conversions on various minor roads	31,800	720	2077
Total Savings p.a.		£5,424	15,640kg
Total Savings over 25 years minimum life of projects		£135,600	391 tonnes

All sites are subject to the availability of funding and suitability of design to accept dimming within requisite standard for lighting