

AGENDA MANAGEMENT SHEET

Name of Committee Environment and Economy Overview and Scrutiny Committee

Date of Committee 4 March 2010

Report Title Street Lighting and Energy Efficiency Measures

Summary This report provides information on street lighting energy use, the actions which have been taken to reduce use, and the options for future reductions including switching off selected lights for periods during the night.

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Would the recommended decision be contrary to the Budget and Policy Framework? No

Background Papers None.

CONSULTATION ALREADY UNDERTAKEN:- *Details to be specified*

Other Committees

Local Member(s)
(With brief comments, if appropriate)

Other Elected Members Councillor M Doody
Councillor R Sweet } for information
Councillor J Whitehouse }

Cabinet Member Councillor A Cockburn – for information
(Reports to The Cabinet, to be cleared with appropriate Cabinet Member)

Chief Executive

Legal I Marriott

- Finance
- Other Chief Officers
- District Councils
- Health Authority
- Police
- Other Bodies/Individuals

FINAL DECISION **NO** *(If 'No' complete Suggested Next Steps)*

SUGGESTED NEXT STEPS :

Details to be specified

- Further consideration by this Committee
- To Council
- To Cabinet As part of the County Highways Annual Plan or when a policy decision is required.
- To an O & S Committee
- To an Area Committee
- Further Consultation

**Environment and Economy Overview and Scrutiny
Committee – 4 March 2010**

Street Lighting and Energy Efficiency Measures

**Report of the Strategic Director for
Environment and Economy**

Recommendation

This Committee supports:-

1. Actions being taken to reduce street lighting energy by using newer technology.
2. The extension of dimming, where designed using National Standards.
3. Demonstrations of part night operation of street lights with a view to formulating a policy for larger scale part night operation in future years.

1. Introduction

- 1.1 This report provides information on street lighting energy, including: the amount used; the cost and the resulting CO2 emissions; the actions being taken to reduce use and the options for future reductions.
- 1.2 Street Lighting is used in this report to include all illuminated items looked after by the County Highways Street Lighting team which include lights, bollards, belisha beacons, illuminated signs etc. Further information on different types and quantities of lights, signs etc is given in **Appendix A**.
- 1.3 Reducing unnecessary costs and CO2 emissions is important for the Council and hence options to reduce street lighting energy use must be considered.

2. Street Lighting Energy use

- 2.1 The following table shows the amount of energy used for street lighting over the past few years the resulting CO2 emissions and the total amount paid. Present use represents some 35% of the total Council's electricity use (including schools).

| Year | Energy Used (kWh) | CO2 Output | Cost |
|---------|---------------------------|---------------|-----------------------------|
| 2003/04 | 21,650,158 | 11,700 tonnes | £842,000 |
| 2004/05 | 21,648,915 | 11,700 tonnes | £924,000 |
| 2005/06 | 21,182,644 | 11,450 tonnes | £1,200,000 |
| 2006/07 | 21,919,471 | 11,850 tonnes | £1,310,000 |
| 2007/08 | 22,878,272 | 12,370 tonnes | £1,643,000 |
| 2008/09 | 24,406,575 | 13,190 tonnes | £2,590,000 |
| 2009/10 | 24,465,000 (estimated) | 13,200 tonnes | £2.4 million (estimated) |

- 2.2 With a constant street lighting stock year on year changes to the amount of energy used can be due to weather changes (darker days mean lights come on earlier) and by any actions to upgrade the stock to reduce energy use.
- 2.3 Over the past few years total energy use has increased mainly due to more roads being looked after (including a number of detrunked roads such as the A435 and A446) but also due to: new signs being installed; Parish Councils passing us their road lighting stock and some lighting upgrading funded, primarily, to reduce crime and fear of crime.
- 2.4 It can be seen that rising energy prices have substantially increased the payments made in spite of actions by the County to secure competitive prices (see next section).

3. Street Lighting Energy Contract

- 3.1 In 1996, and for a number of years following, Warwickshire substantially reduced the amount paid for street lighting energy by going out to tender. The County was one of the first to take such action when the market was deregulated. In recent years ESPO let the energy contract on our behalf. At the same time they also let the contract for a number of other counties which reduced the contract letting fees we paid.
- 3.2 In 2008, following a proposal by ESPO, Warwickshire, and several other counties, agreed to combine together to bulk purchase both the buildings and street lighting energy. Purchasing '24 hour' electricity in this way has again reduced the total energy bill for the County.
- 3.3 One drawback with the latest contract is that the Council may not benefit immediately from large changes in energy use (such as through part night operation of a high percentage of the lights). Notice will have to be given through ESPO to the energy supplier so that they are aware of any such night time variation in demand.

4. Street Lighting Energy Savings

- 4.1 Details of street lighting energy saving achieved over the years is given in table 2a in **Appendix B**. Details of potential future savings and the potential costs are given in Table 2b in **Appendix B**.
- 4.2 It is clear that energy savings from the existing network are only achieved as a result of manufacturers improvements in street lighting equipment. Over the years specifications have been changed to take advantage of new equipment when new lighting units are installed or existing lighting units need repairs.
- 4.3 The rate of development of new equipment does mean it is necessary to take a cautious approach to its use. For instance the County has begun to use the lower energy Cosmopolis lighting, which has been installed in some other locations in the UK, but there is recent evidence to suggest that LED lighting may soon be available commercially which should have an even lower energy use.
- 4.4 Most energy saving actions presently undertaken are only justified when existing equipment has failed. The only action which might justify a more immediate spend, apart from street light dimming or part night operations which are described in following sections, is the fitting of electronic ballasts (which control the operation of the lights) in place of older traditional operating gear in 35W low pressure sodium lanterns.

5. Street Light Dimming

- 5.1 A report giving details of the dimming trials and street light dimming activity in Warwickshire is given in **Appendix C**.
- 5.2 It is clear from the trials that a system, designed in accordance with the National Standards with light intensity varied during the night according to road use, provides appropriate lighting levels for road users and residents. Although the cost of the dimming system is relatively high there are potential savings to be made when used with the higher powered high pressure sodium lamps or from newly installed lights with factory fitted dimming equipment.
- 5.3 To date, in Warwickshire and elsewhere, there have been some reliability problems with dimming equipment. Where dimming is in operation in other countries they appear to have high equipment costs and/or use different electricity cable systems than exist in the UK which makes the operation of the dimming more reliable.
- 5.4 It is recommended that dimming should be extended, wherever possible, in the future, with designs in accordance with National Standards, and with the equipment to be used depending on the results of the ongoing trials.

6. Street Lighting Removal

- 6.1 In other areas of the country some councils have chosen to remove some of their existing street lights. They tend to have chosen rural locations to do this.

Lighting on rural roads is generally installed as a road safety measure but some of the latest research indicates a low level of casualty reduction compared to the costs of the street lighting installed.

- 6.2 Although removing street lights gives a monetary and a CO2 saving, it could result in an increase in casualties. It is suggested that there is limited benefit in considering this further at this stage.

7. Street Lighting Part Night Operation

- 7.1 Another initiative that is being carried out elsewhere is switching off lights when usage is low in the early hours of the morning. This approach allows the lights to be in operation when people and traffic use the roads and pavements but to ensure that energy is not wasted when use is very low.
- 7.2 Historically lights in residential roads were often turned off at midnight. It is quite frequently the case in villages that no lighting or very limited lighting is available. It should be possible to identify locations where street lighting switch off in residential areas in the early hours is supported.
- 7.3 Outside town centres, lights on main roads are primarily provided to improve road safety. When road use is very low any benefit from the lights will outweigh their costs. Part night operation of lights on these roads might be seen as an extension of dimming with lights turned off when usage does not justify any lighting at all. A standard photocell exists that will turn off lights between about midnight and 5.30am. These photocells can be installed relatively cheaply.
- 7.4 It is important that this initiative is progressed further. Initially some demonstration sites would be appropriate particularly on main roads leading away from towns. It is suggested that these are undertaken following consultation with the Police and the Road Safety Group regarding locations, but with at least one site in each District. The purpose of undertaking the demonstration sites would be to help Members make an informed decision on a policy for larger scale part night operation in future years.
- 7.5 Assuming that sufficient locations are identified where part night operations will be appropriate notice can be given to ESPO to ensure future energy contracts allow for a variable demand in electricity in Warwickshire during the night.

8. Summary and Conclusions

- 8.1 The cost of street lighting energy is substantial and represents some 35% of the Council's electricity use (including schools). Opportunities to reduce use without compromising safety need to be considered.
- 8.2 New developments in equipment continue to help reduce energy use. In most instances installing lower energy equipment can only be justified when existing components require replacing but, where financially justified, new lower energy equipment is installed as soon as is practicable.

- 8.3 Dimming has been found to be an acceptable process where carried out in accordance with new National Standards. At present there are some reliability concerns about the dimming equipment available and trials of the systems continue.
- 8.4 Part night operation of street lights should be progressed further and, as with dimming, this can be done initially through trials but moving quickly to identifying the policy of where part night operation is acceptable.

9. Financial Implications

- 9.1 Street lighting energy costs represent some 35% of the total Council's electricity costs (inc schools). Equipment improvements have, over the past 15 years reduced the total use by some 7%. Investment should, in the future, allow further reductions of around 10%. In the next few years further savings will only be available through having part night operation.

PAUL GALLAND
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23 February 2010

**Appendix A of Agenda No
Environment and Economy Overview and Scrutiny Committee
4 March 2010**

Street Lighting and Energy Efficiency Measures

| Street Lighting items and their approximate Energy Use – January 2010 | | | | |
|---|---------------|---------------------|-------------------|---|
| Light Type | Number | Annual kWh per lamp | Total kWh | Notes |
| CO = Conventional Gear (highest energy use), L = Low Loss Gear (medium energy use), ELE = Electronic Gear (lowest energy use) | | | | |
| <u>Low Pressure Sodium Lights</u> | | | | Orange Light Source |
| 35W SOX CO | 2138 | 268 | 572,984 | |
| 35W SOX L | 8009 | 240 | 1,922,160 | |
| 35W SOX ELE | 1 | 161 | 161 | One sample of a retrofit unit under trial |
| 55W SOX CO | 178 | 347 | 61,766 | |
| 55W SOX L | 1002 | 277 | 277,554 | |
| 90W SOX CO | 624 | 508 | 316,992 | |
| 90W SOX L | 4322 | 430 | 1,858,460 | |
| 135W SOX CO | 291 | 723 | 210,393 | |
| 135W SOX L | 2294 | 657 | 1,507,158 | |
| 180W SOX CO | 183 | 921 | 168,543 | |
| Total Low Pressure Sodium | 19,042 | (Av 362) | 6,896,171 | |
| <u>High Pressure Sodium Lights</u> | | | | Golden White Light Source |
| 50W SON CO | 24 | 256 | 6,144 | |
| 70W SON CO | 16945 | 372 | 6,303,540 | |
| 70W SON ELE | 1182 | 322 | 380,604 | |
| 100W SON CO | 2065 | 471 | 972,615 | |
| 100W SON ELE | 82 | 467 | 38,294 | |
| 150W SON CO | 2829 | 710 | 2,008,590 | |
| 150W SON ELE | 147 | 644 | 94,668 | |
| 250W SON CO | 4136 | 1152 | 4,764,672 | |
| 400W SON CO | 81 | 1792 | 145,152 | |
| Total High Pressure Sodium | 27,491 | (Av 535) | 14,714,279 | |
| <u>Mercury Lights</u> | | | | An old light source that will require replacing by 2015 for environmental reasons |
| 80W Mercury Lights | 937 | 388 | 363,556 | |

| | | | | |
|--------------------------------|---------------|-----------------|-------------------|---|
| <u>Cosmopolis Lights</u> | | | | Newly available lower energy white light source |
| 45W CPO | 10 | 211 | 2,110 | |
| 60W CPO | 51 | 280 | 14,280 | |
| 60W CPO LS | 89 | 244 | 21,716 | |
| Total Cosmopolis Lights | 150 | | 38,106 | |
| <u>Metal Halide Lights</u> | | | | White Light Source used mainly in Leamington Town Centre |
| Total Metal Halide | 691 | | 377,104 | |
| TOTAL STREET LIGHTING | 48,311 | | 22,390,000 | |
| <u>Bollards</u> | | | | |
| Traditionally lamped bollards | 1739 | 245 | 426,542 | |
| Mains powered LED bollards | 73 | 210 | 15,330 | |
| Solar powered bollards | 114 | 0 | 0 | |
| Total Bollards | 1926 | | 442,000 | |
| Belisha Beacons | 136 | Av 111.6 | 15,000 | |
| <u>Illuminated signs</u> | | | | |
| Without Photocells | 2495 | Av 263 | 656,185 | |
| With photocells | 2010 | Av 124 | 249,240 | |
| Total Illuminated Signs | 4505 | | 905,000 | |
| Other | | | 713,000 | Includes Vehicle actuated signals, Pedestrian refuge indicators, supplementary crossing lights LED signs etc. |
| TOTAL ANNUAL ENERGY USE | | | 24,465,000 | |

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Street Lighting and Energy Efficiency Measures

| Action taken | Number | Electricity Reduction per unit kWh | Annual saving kWh |
|---|------------|------------------------------------|-------------------|
| From 1996 – 3W photocells replaced with 1W photocells (completed) | 50,000 | 17.5 | 875,000 |
| From 2005 – 1W photocells replaced with 0.25W photocells | 11,850 | 6.57 | 78,000 |
| From Approx 1955 – Install photocells in new illuminated signs | 2010 | 139 | 279,000 |
| From 2003 – Fitting LED units in Belisha Beacons (completed) | 136 | 111.6 (av) | 104,000 |
| Electronic Gear SON lantern instead of traditional gear (only readily available for new lanterns) | 182 147 | 50 65 | 59,000 9,600 |
| Replacing lit bollards with unlit Flecta posts or signs (where permitted by regulations) | 100 (est) | 245 | 24,500 |
| Replacing lit bollards with solar powered Flecta posts | 114 | 245 | 28,000 |
| From 2008 – Removing lights from illuminated signs (where no longer required by regulations) | 188 | Varies | 40,000 (est) |
| Cosmopolis Lighting (installation in place of SON lighting for new schemes) | 150 | Varies | 75,000 |
| Dimming – retrofit units | 101 | Varies | 36,500 |
| Dimming – Cosmopolis lighting | 89 | 36 | 3,200 |
| Total | | | 1,600,000 |

| Action | Additional Cost | Number | Electricity Reduction per unit kWh | Annual saving kWh |
|---|--|--|------------------------------------|--------------------|
| Continue replacing 1W photocells with 0.25W photocells | Zero if replacement done when old unit fails £7 per unit or £245,000 total if done at 4 year bulk lamp change and clean | 35,000 | 6.57 | 230,000 |
| Continue removing lights from illuminated signs (where no longer required by regulations) | Most of the low cost light removals have been done. Future costs perhaps £350 a unit or £175,000 total | 500 | Varies | 100,000 (est) |
| Expand retrofit dimming on appropriate existing 150W and 250W SON lanterns | £150 a unit (est) assuming some 15% need upgrading or £750,000 total | 5,000 (est) assuming part night operation is not preferred | Varies | 1,825,000 |
| Install newly available Electronic Ballast on 35W low pressure sodium lamps | £50 a unit if installed at 4 year bulk lamp change and clean | 8,000 2,000 | 78 106 | 624,000 212,000 |
| Install LED lamps (when available) in place of existing SON lamps | Unknown as the technology is still being developed although it is hoped that the first trial lamps may be available during 2010. | | ? | ? |

**Environment and Economy Overview and Scrutiny
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Street Lighting and Energy Efficiency Measures

Street Lighting Dimming in Warwickshire

1. Background

- 1.1 Following extensive Member debate in various Committees during 2007, a trial of street light dimming in the Warwick District Area was agreed. A trial, involving the dimming of selected lights outside the rush hour period, began at several locations within the District in Summer/Autumn 2008.
- 1.2 In 2007 street light dimming was still new and relatively untried with few examples of it in use in the UK. Now 3 years later, although it is still relatively expensive, its introduction, in appropriate circumstances, can be considered to be part of the normal design process.

2. Design Best Practice

- 2.1 It is standard practice to have brighter street lighting systems on well used main roads and lower lighting level systems on minor roads and estates. Before dimming became available the design process, in the British Standard Lighting Code of Practice, set lighting levels based on peak hour traffic flows. The current British Standard now acknowledges that 'Traffic flow can significantly vary during the night, and different lighting levels at some periods may be considered.'
- 2.2 The Institution for Lighting Engineers Technical Report 27 – Code of Practice for Variable Lighting Levels for Highways provides guidance on designing variable lighting levels and has been used in the street light dimming designs in Warwickshire.

3. Retrofit Dimming Equipment

- 3.1 There are at present two main types of dimming systems that can be fitted to existing street lights. The more expensive equipment involves a remote central controller and receiving equipment in each light. A cheaper option has a controller in each light, each of which need programming.
- 3.2 The system selected for the initial dimming trial in Warwickshire was one involving controllers in each light. These were affordable, could be installed relatively quickly and also gave immediate reductions in energy costs without the need for third party monitoring.

4. Initial Dimming Trial and Findings

4.1 The locations selected for the trial are shown in the table below.

| Location | No of Lights |
|----------------------------|--------------|
| Tachbrook Road Whitnash | 21 |
| Warwick Road Kenilworth | 8 |
| Leamington Road Kenilworth | 15 |
| Birmingham Road Warwick | 20 |
| Birmingham Road Hatton | 37 |
| Total | 101 |

4.2 The approximate costs of the trial were £100 per unit, purchase and installation costs, plus an estimated £4,000 to upgrade lights which would not initially work with the dimming equipment. This equated to an average of £140 per unit.

4.3 The energy saving per light has varied depending on the wattage of the light and the degree of dimming. Total annual savings from the trial has been estimated at 36,540kWh or about £35 a light at the average electricity costs over the past 2 years.

4.4 Other points to note are:-

- 2 lighting units could not be made to work with the dimming equipment.
- 13 lighting units needed extensive upgrading before they would operate with the dimming equipment.
- Dimming took place between 7.00pm and 6.00am.
- Both 150W and 250W lights were selected for the trial,
- Annual energy savings per light varied from about £20 a year to about £50 a year.
- No comments were received from the public about the lights.
- The dimming equipment will only operate on High Pressure Sodium Lights.
- It is not known how long the dimming equipment will last before needing replacing.
- The dimming equipment can only be reprogrammed by visiting each light individually.

5. Stage 2 Dimming Trial

5.1 The initial trial was paid for from existing street lighting budgets. Recently Government funding was awarded to the Council in recognition of the highway inventory collection activity undertaken and its use in reducing costs. A part of this Government money has been set aside to extend the dimming trial to test effectiveness and benefits of a remote central controller system.

- 5.2 The proposal is to establish a central controller at the Budbrooke Depot with about 100 lights selected for dimming so that they can be controlled from this location. The present cost of the trial is estimated at £12,000 to establish the base station and £150 a light equipment installation costs. Further lights could be added to the system if the initial trial is a success.
- 5.3 One action required before cost savings can be achieved from this equipment is the appointment of a new independent monitoring company. Street Lighting is not metered and energy suppliers require an independent monitor to review the energy use. This is usually done by listing the equipment used (each item of which has a nationally rated wattage) with the independent monitor measuring the switch on and switch off times. The Council's present independent monitor is unable to measure the electricity use from lights controlled from a central unit.

6. Dimming on new equipment

- 6.1 Some recent lighting renewals in Nuneaton and Bedworth and North Warwickshire have allowed lights to be upgraded using a lower energy Cosmopolis white light source. As these units have a design life of 25 years the opportunity was taken to use lights with a factory fitted dimming unit which reduces the lighting levels during a 6 hour period in the middle of the night.
- 6.2 The extra costs of the factory fitted dimming units, compared to normal Cosmopolis lights is £25. The energy saving of each unit is about £3.60 a year.