This report is an update on the ongoing aim by the council to reduce the energy consumption of street lighting both in terms of reducing the corporate carbon footprint and its energy costs, and recommends the continued use of dimming at certain times of the day in replacement schemes along with the use of modern technology for street lighting.

1. It is recommended that the committee:

   (i) notes the ongoing pressures to reduce electricity costs and the council’s carbon footprint specifically in relation to street lighting;

   ii) authorises the Head of Roads to continue with the dimming of street lighting in replacement schemes along with the use of white light, electronic control gear and use of “trimming” (see para. 3.4.3) along with other modern technology to conserve energy as set out in this report.

2. The ongoing requirements to reduce the carbon footprint of street lighting was previously reported to this Committee in Report No. 186/09 on 3 March 2009.

2.1 The continuing requirement for the street lighting to reduce its energy costs has previously been reported to this Committee (Report No. 1148/08 - 25 November 2008), with the present costs having a significant impact on the Roads Division’s revenue budget.

2.2 Report No. 856/08 detailed the council’s Carbon Reduction Commitment and the legislative requirement for the council to reduce its CO2 emissions to set targets by 2020 and 2050.

2.3 Report No. 194/10 detailed the council’s initial trial with the use of dimming in certain areas along with the outcome of a residents’ survey.

3. Variable Road Lighting Levels (Dimming)

3.1 Variable lighting levels provide an opportunity for improving energy, efficiency and achieving carbon savings through the dimming of street lighting related to traffic flows. Reducing road lighting levels at an appropriate time of day also has additional environmental benefits by further reducing light intrusion and light pollution.

3.1.1 The British Standard (BS5489) allows for lighting levels to be reduced and the Institution of Lighting Professionals Technical Report (TR) 27 Code of Practice for Variable Lighting Levels for Highways provide recommendations of applying variable lighting to traffic routes.

3.1.2 Dimming can be incorporated into both existing street lights, by replacing conventional control gear with electronic control gear, and in new installations which have electronic control gear fitted as standard. Dimming typically reduces energy consumption by 25% during the hours that the lights are dimmed.
3.1.4 To date nine replacement schemes have utilized dimmable control gear along with another six conversion, luminaire only, schemes which have been completed. (Appendix 1).

3.1.5 It is recommended that the council continues with the use of dimmable control gears within its programme of replacement and new installations and in addition:

- Previous reports restricted the use of dimmable units to within residential areas but given the successful response it is proposed to utilize dimmable control gear on all traffic routes to reduce lighting levels by one class between 24:00 and 06:00 as part of replacement schemes.
- To investigate the use of dimmable control gear on existing sites which would prove effective in saving energy. Sites will be prioritized as part of our ongoing conversion schemes on lamp wattage, concentrating on the larger 250w lamps to maximize savings. The proposed savings per lamp would be £11.93 and a reduction in the carbon footprint of 69kgs per year.

3.1.6 There are no additional costs for the installation of dimming control gear as these would be included within the capital costs of the replacement schemes. There would be a reduction in energy costs of around £14.13 per unit per annum and it would reduce our carbon footprint by 0.08 tonnes per lighting unit per year.

3.2 White Light in Residential areas

3.2.1 British Standard (BS5489) allows a reduction of one lighting class in residential areas if a light source has a colour rendering index (Ra) of greater than 60. This is deemed as “white light” and research has proved that the use of white light provides an equivalent level of illumination when compared to traditional lighting sources of both high pressure (golden) and low pressure (orange) sodium lamps. Modern ‘white light’ sources include the Cosmopolis lamp (CPO), compact fluorescents (PL-L & PL-T) and LED’s.

3.2.2 Table 1 below shows the typical reduction in light output that can be achieved by using white light. The lighting requirements for subsidiary roads and associated areas are classified according to the public use, the crime risk and the traffic use. The unit of measurement used to measure the amount of light falling on a surface is lumens per square metre or lux. Thus reduction in lighting levels allows a potential reduction in both lighting units and energy consumption.

<table>
<thead>
<tr>
<th>Lighting Class</th>
<th>Lux (Minimum Maintained)</th>
<th>White Light Class</th>
<th>Lux (Minimum Maintained)</th>
<th>% Reduction in light levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>15</td>
<td>S2</td>
<td>10</td>
<td>5/15 = 33%</td>
</tr>
<tr>
<td>S2</td>
<td>10</td>
<td>S3</td>
<td>7.5</td>
<td>2.5/10 = 25%</td>
</tr>
<tr>
<td>S3</td>
<td>7.5</td>
<td>S4</td>
<td>5</td>
<td>2.5/7.5 = 33%</td>
</tr>
<tr>
<td>S4</td>
<td>5</td>
<td>S5</td>
<td>3</td>
<td>2/5 = 40%</td>
</tr>
<tr>
<td>S5</td>
<td>3</td>
<td>S6</td>
<td>2</td>
<td>1/3 = 33%</td>
</tr>
<tr>
<td>S6</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.2.3 At the time of writing this report all the schemes in Appendix 1 & 2 have had white light installed resulting in an energy cost saving of around £3,279 and a reduction in our carbon footprint of 18.6 tonnes per annum. Whilst these reductions are for the schemes completed this year, the overall energy costs and carbon footprint for the lighting stock as a whole remains around the same as in the previous year due to the adoption of new lighting within private developments which have increased the energy costs and carbon footprint of the council’s lighting stock.
3.2.4 An LED (light emitting diode) trial is proposed for the A92 Dual carriageway to provide the following benefits

- Long life expectancy, 25 years as opposed to 4 years for conventional lamps.
- Future maintenance costs reduced due to reduced traffic management requirements.
- Reduced energy costs by £37 and our carbon footprint by 0.2 tonnes per unit per year.

3.2.5 However the capital costs of LED lights remains high compared to conventional lamps.

3.2.6 It is recommended that future lighting schemes

- Utilise the most cost effective white light solution within all residential areas.
- Utilise compact fluorescent light sources within Class S5 & S6
- Utilise Cosmopolis light sources within Class S4 and above
- Continue to monitor the development/progress of LED luminaires for use within residential areas as at present the high costs of the luminaires outweigh the limited savings in both energy costs and CO2 emissions and look to introduce them when they provide the most cost effective solution. As this is a fairly new innovation within street lighting there is also limited information on the sustainability of LEDs for external lighting.

3.3 **Electronic Control Gear**

3.3.1 Electronic control gear replaces the traditional control gear that consists of a ballast, capacitor and ignitor. The electronic ballast control gear will reduce the overall total circuit wattage and have the added advantage that it can be used for dimming purposes. Light sources such as compact fluorescents, Cosmopolis and LED’s have electronic control gear as standard, whilst electronic ballasts are available for traditional light sources.

3.3.2 Table 2 below shows the typical savings in both energy costs and CO2 emissions that can be achieved by using electronic control gear.

<table>
<thead>
<tr>
<th>Lamp Type &amp; Power</th>
<th>Circuit Wattage Conventional</th>
<th>Circuit Wattage Electronic</th>
<th>Wattage Saved</th>
<th>% Savings/CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>70w</td>
<td>90</td>
<td>79</td>
<td>11</td>
<td>12.2</td>
</tr>
<tr>
<td>100w</td>
<td>114</td>
<td>109</td>
<td>5</td>
<td>4.3</td>
</tr>
<tr>
<td>150w</td>
<td>172</td>
<td>156</td>
<td>16</td>
<td>9.3</td>
</tr>
</tbody>
</table>

3.3.3 It is recommended that:

- All new luminaries are to be fitted with electronic control gear up to and including 150W lamp.
- The Roads division monitors the development of electronic ballasts for lamps greater than 150W and introduce them when they become cost effective.
- All traditional control gear replaced during routine maintenance shall be converted to electronic control gear where possible

3.4 **Trimming**

3.4.1 Modern fully electronic photocells consume only 0.25W as opposed to 3W (during daylight) for an older thermal photocell, which are currently fitted to many of the existing lighting units. Photocells are calibrated to switch lights on and off typically from dusk to dawn. At no extra cost new electronic photocells can be calibrated to reduce the number of hours that a street light works. This is called ‘trimming’. Trimming reduces the number of burning hours by changing the switch on and switch off illuminance levels. At present the switching on/off
levels are 70 lux on and 35 lux off (70/35). Reducing the switching ratio to 35/18 can typically save 92 burning hours per lighting unit per year.

3.4.2 If the entire network was fitted with a trimming photocell (35 lux on/18 lux off) it would reduce the cumulative hours that street lights are operational by 21006 hours, the current number of lighting units x 92 = 1,932,552 hours per year. This is the equivalent of £179 per year and 1.04 tonnes reduction in our carbon footprint.

3.4.3 It is recommended that:

- All new lighting controls will be installed with photocells that consume a maximum of 0.25W with a switching ratio of 35/18.
- Old thermal photocells shall be replaced during routine maintenance visits where possible.

4 FINANCIAL IMPLICATIONS

4.1 The costs of the above proposals will be contained within available street lighting budgets.

4.2 Any potential saving in the street lighting budgets will be reinvested in future replacement programmes allowing further savings in energy costs and a reduction in our carbon footprint.

5 HUMAN RIGHTS IMPLICATIONS

5.1 There are no human rights implications arising from the proposals in this report.

6 EQUALITIES IMPLICATIONS

6.1 The issues contained in this report fall within an approved category that has been confirmed as exempt from an equalities perspective.

7 SINGLE OUTCOME AGREEMENT

7.1 This report contributes to the following local outcome(s) contained within the Single Outcome Agreement for Angus.

- Sustainable business growth is achieved.
- Communities in Angus are safe, secure and vibrant.
- Resources are used effectively.

8 CONSULTATION

8.1 The Chief Executive, Director of Corporate 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 is an update on the progress made to date 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 the continuing use of dimming along with the use of modern technology.

ERIC S LOWSON
DIRECTOR OF INFRASTRUCTURE SERVICES
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 186/09 - Reducing The Energy Consumption Of Street Lighting - Infrastructure Services Committee of 3 March 2009

Report 1148/08 Electricity Costs Associated with Street Lighting etc 2008/2009 - Infrastructure Services Committee of 25 November 2008

Report 856/08 Introduction of the Carbon Reduction Commitment Obligation - Infrastructure Services Committee of 4 September 2008

Institution of Lighting Professionals Technical Report 27 Code of Practice for Variable Lighting Levels for Highways

Roads/JG/JS
APPENDIX 1

Schemes Completed 2010/11

Cairnie Crescent, Arbroath
Cliffburn Road, Arbroath
Dishlandtown Street, Arbroath
Caesar Avenue, Carnoustie
Brown Street, Carnoustie
Inchgarth Street, Forfar
Lochside Road, Forfar
Kennedy Avenue, Montrose
Provost Reid’s Road, Montrose

Conversion Schemes Completed 2010/11

Airlie Street, Brechin
Duke Street, Brechin
Latch Road, Brechin
Taylor Street, Forfar
Victoria Street, Carnoustie
The Glens Area, Montrose
APPENDIX 2

White Light Schemes 2010/11

Bellevue Place, Arbroath
Elmhill, Arbroath
Gallowden Road, Arbroath
Glamis Road, Arbroath
Kinghorne Street, Arbroath
Monkbarns, Arbroath
Rose Street, Arbroath
Thornton Gardens, Arbroath
Golf Road Park, Brechin
Eskpark Terrace, Brechin
Linefield Road, Carnoustie
Ravensby Park Gardens, Carnoustie
Taymouth Street, Carnoustie
Arbroath Road, Forfar
Dundee Road, Forfar
Inchgarth Avenue, Forfar
Lyninghamills, Forfar
Whitehills Crescent, Forfar
Restenneth Place, Lunanhead
Benmore Avenue Area, Montrose
Ferry Street Area, Montrose
Museum Street, Montrose
Patons Lane, Montrose
Thomson Terrace, Montrose
Solway Gardens, Monifieth
Wemyss Crescent, Monifieth
White Light Conversion Schemes 2010/11

Abbotsford Road Area, Arbroath
Banks of Brechin
Cookston Crescent, Brechin
Smieton Street Area, Carnoustie
The Glens Area, Forfar
Service Road, Forfar
Westfield Loan, Forfar